Heart.
Sternum.
Diaphragm
Pylorus.
Stomach.
Transverse Colon
Omentum.
Small
Intestine.
Fundus. of Uterus.
Body of Uterus:
Bladder
Symphysis Pubis.
Urethra.
Vulva.

Lungs.
Liver.
Pancreas.
12th Dorsal Vertebra.
Mesentery.
Aorta.
Vena cava.
Spinal canal.
5th Lumbar Vertebra.
Promontory of Sacrum.
Sacrum.
Pouch of Douglas.
Neck of Uterus.
Rectum.
Vagina.
Anus.

SECTION THROUGH THE FEMALE BODY SHOWING THE PECTORAL, ABDOMINAL, AND PELVIC ORGANS.

GYNÆCOLOGY FOR NURSES AND GYNÆCOLOGICAL NURSING

INCLUDING THE SUBJECTS ENUMERATED, UNDER "GYNÆCOLOGY AND OBSTETRICS,", IN THE "SYLLABUS OF LECTURES AND DEMONSTRATIONS FOR EDUCATION AND TRAINING IN GENERAL NURSING" ISSUED BY THE GENERAL NURSING COUNCIL FOR ENGLAND AND WALES

BY

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BIRMINGHAM, BRISTOL, CAMBRIDGE, GLASGOW, LEEDS, LIVERPOOL, LONDON, MANCHESTER
OXFORD, ST. ANDREWS, SHEFFIELD AND WALES, TO THE CONJOINT BOARD OF
ENGLAND, AND TO THE SOCIETY OF APOTHECARIES
CHAIRMAN OF THE CENTRAL MIDWIVES BOARD

NINTH EDITION

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ABDOMINAL, AND PELVIC ORGANS.

PREFACE TO THE NINTH EDITION.

THE subject-matter of this edition has been thoroughly revised, parts have been rewritten, many paragraphs have been simplified and most repetitions deleted. I have transferred the sections on Micro-organisms, Blood Transfusion, X-rays and Radium to an Appendix, since it seemed to me that their position in the last edition rather confused the general run of the book. Those nurses who wish to know more of these subjects than might be required in their examinations, can turn to the Appendix; I trust I may not be too optimistic in thinking that many will be sufficiently keen on their work to do so.

I have, as always, taken advantage of the suggestions which Reviewers of this Handbook have been good enough to make, and am very glad to take this opportunity of acknowledging the great assistance I have received from such Reviews for many years. Among the last Reviews was one which suggested that the Index was not as good as it might be (I agree), and I have taken the opportunity of revising it with the main references in heavier type. Another Review pointed out that the sections on X-rays and Radium "were of a complicated nature". I think that most experts will agree that an endeavour to make these subjects more easily understood, by those not possessed of a sound knowledge of chemistry and physics, is rather difficult. I therefore asked my colleague, Dr. B. W. Windeyer, Professor of Radiology (Therapeutics) at the Middlesex Hospital, to comment on what I had written, and he has most kindly sent me several suggestions which I am sure have increased the value and elucidation of these sections.

The Appendix on Blood Transfusion has been remodelled and brought up to date, including a description of the Rhesus factor. It is rather difficult to make the latter clear, especially to those who are not Research workers, but I have endeavoured to describe its salient features in as simple language as I can command.

From time to time I have ventured to seek the advice of Sister Tutors of some of the leading Teaching Hospitals, with respect to recent advances in Gynæcological Nursing of which I may have been ignorant. For this Edition Miss R. Darrock of the Liverpool Royal Infirmary, Miss M. C. MacKay of the Manchester Royal Infirmary and Miss M. E. Gould of St. Thomas's Hospital, London, have very kindly replied to my enquiry.

To Miss Clark-Kennedy, Educational Supervisor of the Central Nursing Board, I am much indebted for the great care she has taken in reading the proof-sheets.

<div align="right">COMYNS BERKELEY.</div>

June, 1943.

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PART 1.

CHAPTER I.

STRUCTURE OF THE PELVIS, PELVIC FLOOR, GENITAL ORGANS, BREASTS, URINARY ORGANS, AND RECTUM IN THE FEMALE.

Structure of the Pelvis.

PELVIS is the Latin for basin, and the female pelvis is a bony basin to which are attached the body above and the legs below. It consists of 4 bones: the 2 innominate bones, the sacrum and the coccyx, separated by 4 joints, the 2 sacro-iliac joints, the symphysis pubis and the sacro-coccygeal joint (Fig. 1).

The Innominate Bone.—The innominate bone is composed of three separate parts, the ilium, the ischium and the pubis (which meet at the hip joint in a hollow called the acetabulum in which the head of the femur rests), and which, separate in infancy, are firmly united to one another between the ages of 20 and 25 years.

The *Ilium* is that expanded portion of the innominate bone which forms the hip. The *Ischium* is the lowest portion of the pelvis, and that part of it upon which the body rests, when in a sitting posture, is called the tuberosity. The *Pubis*, with its fellow on the opposite side, forms the front of the pelvis, and their point of junction is known as the symphysis pubis.

I

The Sacrum.—The sacrum consists of the upper 5 of the lowest 9 vertebræ of the spinal column, and these are fused into one solid piece of bone. The anterior surface of the sacrum is curved and forms the back of the pelvic cavity. The sacrum is perforated by holes through which arteries and nerves from the spinal cord pass out, to be distributed to the pelvis, the legs and the feet, and the corresponding veins pass in. The intervertebral disc which forms a prominence between the 5th lumbar and 1st sacral vertebra is termed the *promontory*
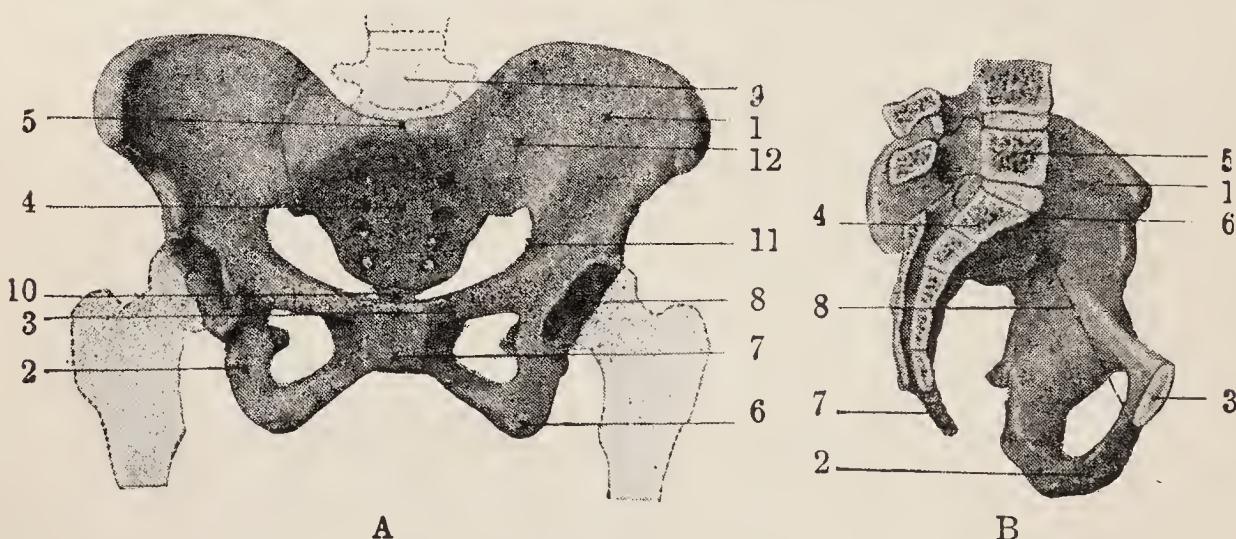
FIG. 1.

A.—The pelvis, front view. 1. Ilium; 2. Ischium; 3. Pubis; 4. Sacrum; 5. Promontory of sacrum; 6. Tuberosity of ischium; 7. Symphysis pubis; 8. Acetabulum; 9. Lumbar vertebra; 10. Coccyx; 11. Brim of pelvis; 12. Sacro-iliac joint.

B.—Pelvis and fourth and fifth lumbar vertebræ divided in half. 1. Ilium; 2. Ischium; 3. Pubis; 4. Sacrum; 5. Fifth lumbar vertebra; 6. Promontory of sacrum; 7. Coccyx; 8. Diagonal conjugate measurement.

of the sacrum. This forms an angle, and if the latter is more marked than normal the diagonal conjugate diameter is shorter, that is the brim of the pelvis is contracted. Each side of the sacrum articulates with the corresponding innominate bone, in the region of the ilium.

The Coccyx.—The coccyx consists of the 4 last vertebræ in the spinal column, and these are also fused into one solid piece of bone. The coccyx forms the lowest part of the back of the pelvis and articulates with the 5th sacral vertebra by the sacro-coccygeal joint.

The Pelvis as a Whole.

The child has to pass through the pelvis before it is born; if, therefore, the pelvis is smaller than normal, it is obvious that the progress of the child, during its birth, may be hindered or even prevented. If the dried pelvis of a female is examined, it will be found to consist of two parts which are divided by a ridge of bone known as the *brim* of the pelvis. The brim is formed by the upper margins of the pubic bones in front, the junction of the ilium with the ischium at the sides, and the front of the promontory of the sacrum at the back. That portion of the pelvis above the brim is known as the false pelvis, and that part below the brim is called the true pelvis.

False Pelvis.—The false pelvis takes no part in the mechanism of labour, and its importance in midwifery is concerned only with certain measurements which can be taken from various points on its surface and which serve to indicate, to some extent, the size and shape of the true pelvis.

True Pelvis.—From the point of view of the mechanism of labour the true pelvis is all-important. Clothed with its muscles and fascia, it is of such a size that the head of the child when in its correct position, namely that of flexion, can just pass through the true pelvis by rotating in a certain direction during its transit. There are certain measurements of the true pelvis which are concerned with the progress of the child through the pelvis. The most important of these which can be taken by a nurse is that extending from the under surface of the symphysis pubis to the promontory of the sacrum. This diameter is known as the *diagonal conjugate* and is, normally, $4\frac{3}{4}$ inches long. By subtracting $\frac{3}{4}$ of an inch from the diagonal conjugate *the true conjugate* diameter, measured from the tip of the sacral promontory to the back and just below the top of the symphysis pubis, can be estimated; this, normally, is 4 inches long. As the true conjugate is the smallest diameter of the pelvis through which the head of the child will have to pass, its importance can easily be realized. If, therefore, the diagonal conjugate is less than $4\frac{3}{4}$ inches long the progress of the child will be impeded, or arrested, according to the amount of diminution which is present.

The bones of the pelvis, at their junction, are bound to-gether by ligaments which soften during pregnancy, and, by stretching, allow a little more room in the pelvis, which to some extent facilitates the passage of the child.

The Pelvic Floor.

Just as the floor of a room supports the various articles of furniture resting upon it, so the pelvic floor, normally, sup-ports the pelvic contents in their correct position. There is this difference, however, that whereas the floor of a room has no holes in it, the floor of the pelvis is perforated in three places to allow of defæcation, micturition, and childbirth. Moreover, whereas the floor of a room is fixed, that of the pelvis, composed as it is of muscles, ligaments, connective tissue, blood-vessels, lymphatics and nerves, is yielding for the performance of the functions mentioned above. The uterus and its appendages, the vagina, bladder and rectum, having been removed, the structure which meets the eye is the upper surface of the pelvic floor, which can be divided into two parts, a deep and superficial. The former consists, principally, of the levatores ani and fascia ; the latter of the superficial perineal muscles, connective tissue, fat, the perineal body and the perineum. The most important of these struc-tures, from an obstetrical and gynæcological point of view, are the *levatores ani* (Fig. 2). During labour, due to the fact that these muscles, with the rest of the pelvic floor, slope downwards and forwards from the back of the pelvis to its front, and downwards and inwards from the sides of the pelvis to the middle line of the pelvic floor, the head of the child is rotated so that its occiput is directed forwards and downwards to the vaginal orifice. As the result of labour the levatores ani and the perineal body may be torn, leaving avenues for the spread of septic infection during the early days of the puerperium. Apart from infection the torn or stretched levatores ani may subsequently lead to ' falling of the womb.'

The female genital organs may be divided into external and internal.

External Genital Organs.

The external organs of generation, otherwise termed the vulva, include all those structures which can be seen between
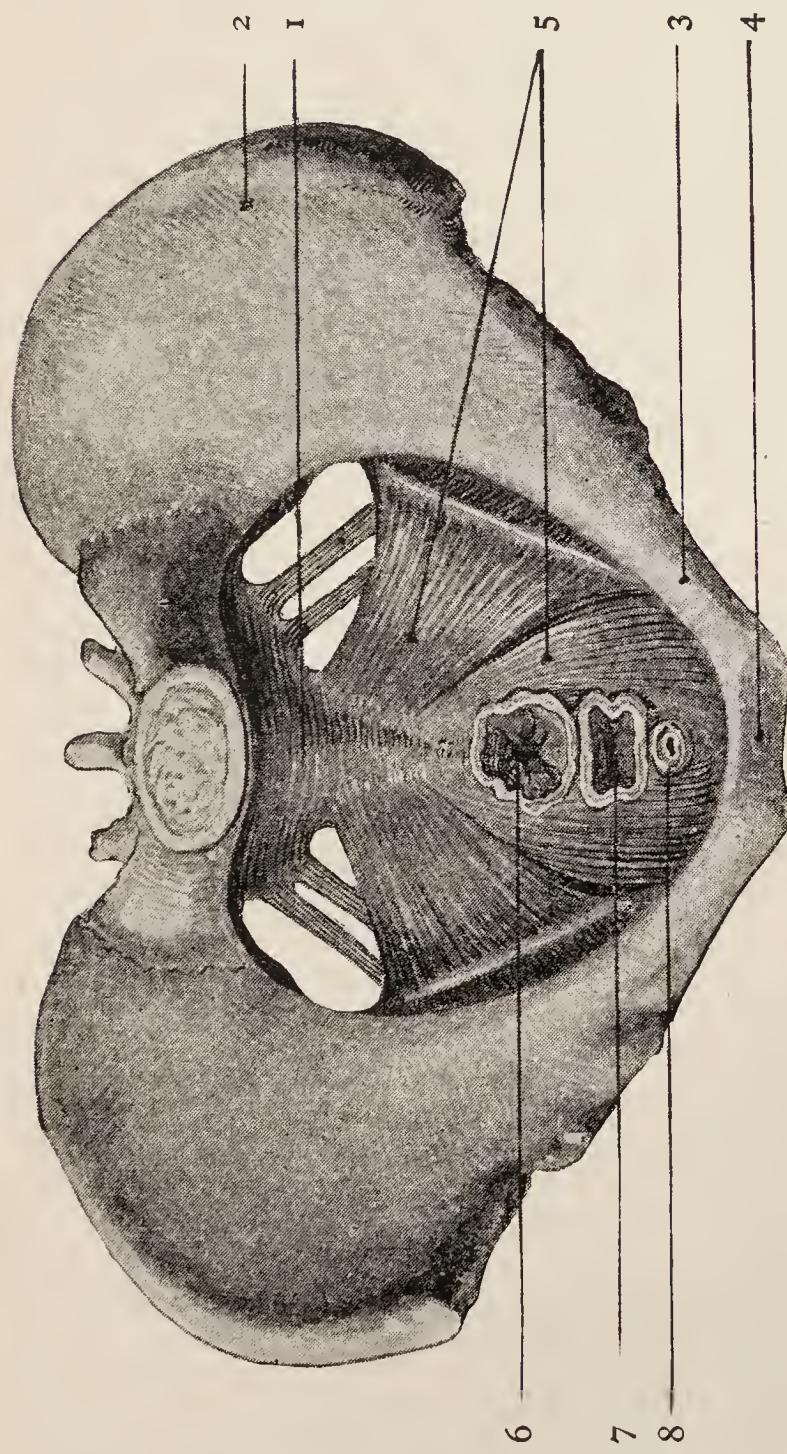
FIG. 2.

Floor of the pelvis. The uterus, Fallopian tubes, ovaries, broad ligaments, vagina, bladder, rectum; cellular tissue, blood-vessels, and nerves removed. Looking down upon it from above: 1. Sacrum; 2. Ilium; 3. Pubis; 4. Symphysis pubis; 5. Levator ani muscles; 6. Rectum cut across; 7. Vagina cut across; 8. Urethra cut across.

the pubes and the perineum when the labia majora are separated, as follows :—

Mons Veneris.—The mons veneris is a pad of fat in front of the pubic bones, and is after puberty covered with hair. It forms the anterior border of the vulva, and the pubic hairs must be cut short before they are shaved prior to an abdominal or vaginal operation.

Labia Majora.—The labia majora, which form the lateral boundaries of the vulva, are continuous in front with the mons veneris and behind with the perineum, and are connected at their posterior extremities by a fold of skin termed the *fourchette* which itself forms the posterior border of the vulva. The labia majora are composed of skin, fat, connective tissue, unstriped muscle, blood-vessels, lymphatics and nerves. The outer surface of each labium majus is covered with skin and after puberty with hair, and it contains many sebaceous glands. The inner surface is smooth, moist and devoid of hairs. The labia majora represent a divided scrotum of the male. Each labium majus contains, in its posterior part, a small gland known as *Bartholin's gland*, so called after the anatomist who first described it. This gland secretes a clear, sticky fluid which escapes by a small duct through an orifice just outside the hymen, especially during sexual excitement. The labia majora may be the seat of a hard or soft chancre, of varicose veins, of a Bartholin's cyst or abscess, or of a tumour.

Labia Minora or Nymphae.—The labia minora are situated between the upper portions of the labia majora and are entirely seen only when the labia majora are separated. In front each labium divides into two folds which, uniting with those of the opposite side, surround the clitoris. The two upper folds form the prepuce, and the two lower the frenum of the clitoris. The posterior extremities of the labia minora gradually blend with the inner surfaces of the labia majora at their lower third. The labia minora are composed of skin and contain connective tissue, a little erectile tissue in the form of unstriped muscle, blood-vessels, lymphatics and nerve endings. The nymphæ are hairless.

Nurses should impress upon patients, when this is necessary, that it is just as important to wash the vulva thoroughly as it is to wash the hands and face or clean the teeth. In the absence of such an ablution a yellow material (smegma) will

collect between the under surface of the prepuce and the clitoris. When preparing a patient for a vaginal operation the nurse should ensure that the vulva has been properly cleaned, since otherwise the presence of smegma will call forth caustic remarks from the operator.

Clitoris.—The clitoris, situated at the apex of the vestibule, is surrounded by the folds of the labia minora. It represents the penis of the male. It is composed of a small mass of erectile tissue and is covered with a very sensitive
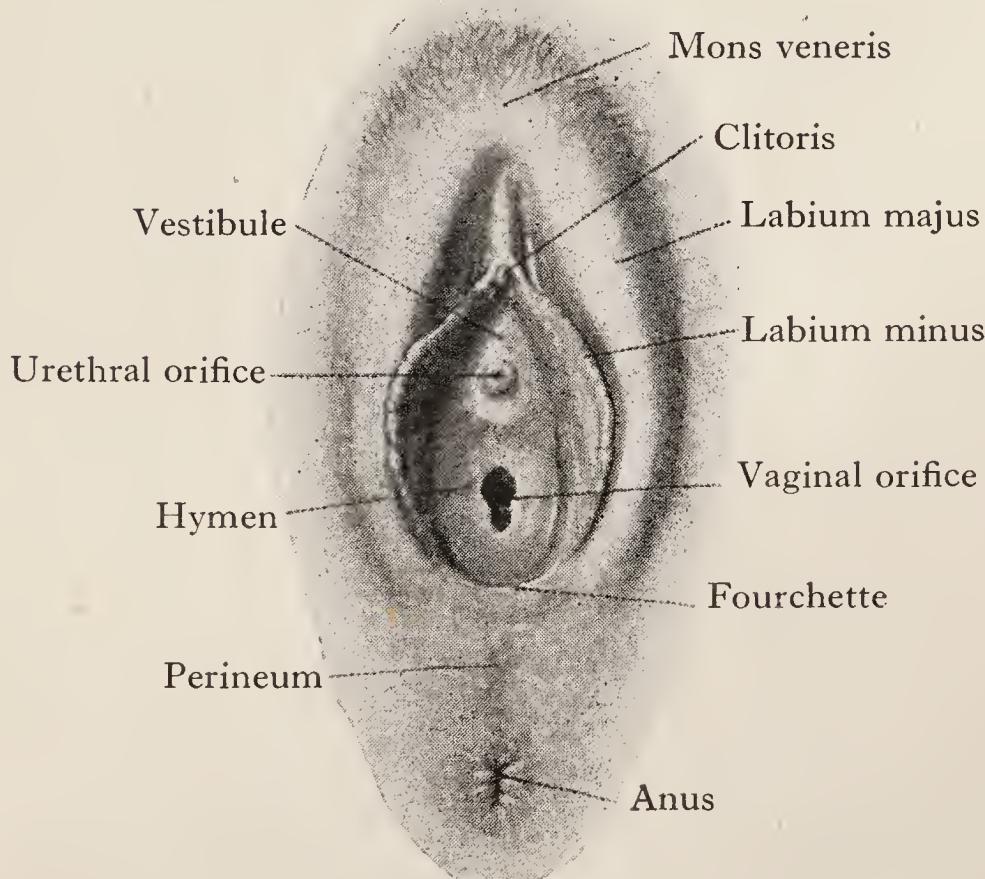
FIG. 3.

epithelium. Care should be taken, when passing a catheter, to avoid touching the clitoris.

Vestibule.—The vestibule is a smooth triangular surface situated at the anterior part of the vulva. Its apex is formed by the clitoris, its sides by the labia minora, and its base by the anterior attachment of the hymen. Just above the centre of the base can be seen the urethral orifice.

The nurse must always remember to swab the vestibule, with some antiseptic solution, just before passing a catheter.

Hymen.—The hymen forms the boundary between the external and internal genital organs. It is composed of connective tissue covered on each side by squamous epi-
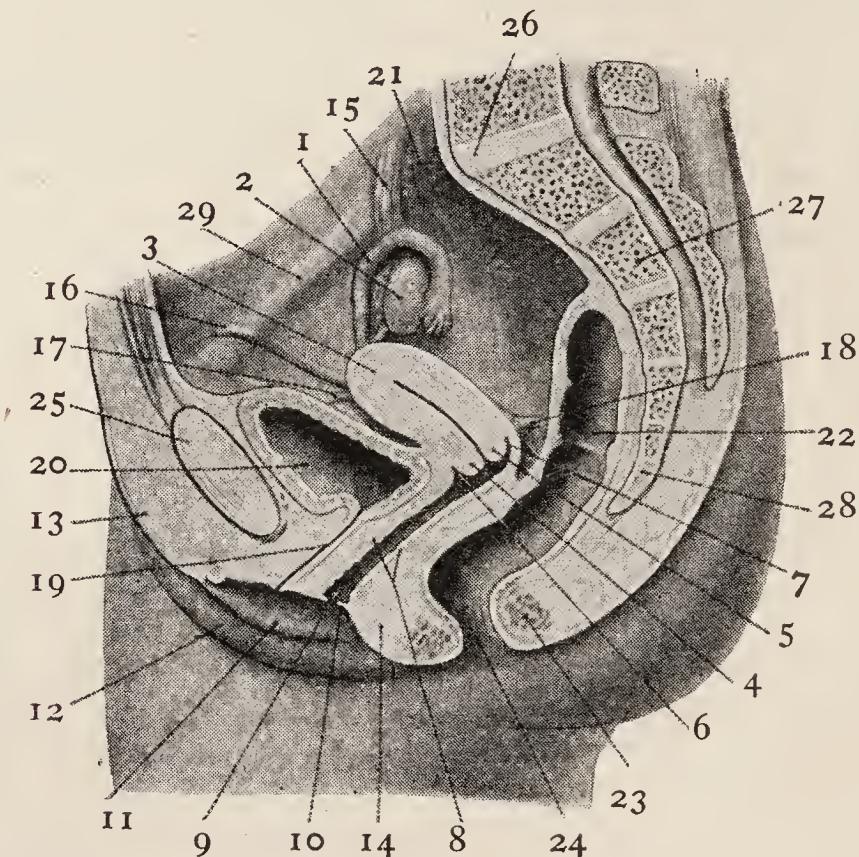
1. Fallopian tube.
2. Ovary.
3. Body of uterus.
4. Anterior lip of cervix.
5. Posterior lip of cervix.
6. Anterior vaginal fornix.
7. Posterior vaginal fornix.
8. Vaginal walls.
9. Vagina.
10. Hymen.
11. Labium minus.
12. Labium majus.
13. Mons veneris.
14. Perineal body.
15. Ovario-pelvic ligament.
16. Round ligament.
17. Utero-vesical ligament.
18. Utero-sacral ligament.
19. Urethra.
20. Bladder.
21. Ureter.
22. Rectum.
23. Sphincter ani.
24. Anus.
25. Symphysis pubis.
26. Promontory of sacrum.
27. Sacrum.
28. Coccyx.
29. Brim of the pelvis.

FIG. 4.

thelium, and is perforated in its centre. It varies in consistence, in some cases being so soft and yielding that a vaginal examination can with ease be made in virgins, in

others it is so tough and resistant that, causing dyspareunia, it has to be incised. The hymen may not be perforated, thus leading, after puberty, to the retention of the menstrual discharge. As a result of coitus and childbirth the hymen is torn and portions of it slough, in the latter cases the pieces which are left being called *carunculæ myrtiformes*.

Fossa Navicularis.—That part of the vulva between the attachment of the hymen and the fourchette is termed the fossa navicularis, and it is on this surface that the primary sore of syphilis is frequently found in an infected woman.

Perineal Body.—The perineal body is a triangular structure somewhat over an inch in length, and is composed of skin, connective tissue, muscle, blood-vessels and nerves. Its apex is situated at the point where the rectum and vagina first meet, and its base, covered by the skin stretching between the orifices of the vagina and anus, is called the *perineum*. The lower inch of the posterior wall of the vagina is closely attached to the anterior surface of the perineal body, and the lower inch of the anterior wall of the rectum is closely attached to the posterior surface of the perineal body.

Internal Genital Organs.

The internal genital organs comprise the following structures :—

The Vagina.

This is a muscular tube, the walls of which, under normal conditions, are in apposition, but which are capable of great distension. It is lined by a membrane similar to that of the skin without its horny layer, so that when it is painted with iodine it becomes the colour of dark mahogany. It is plentifully supplied with blood-vessels, nerves and lymphatics. The length varies—on an average its anterior wall measures $2\frac{1}{2}$ inches and its posterior $3\frac{1}{2}$ inches. From below upwards its direction is towards the back of the patient. From above downwards its direction is forwards towards the vulval opening. Its direction from below upwards indicates the direction in which a vaginal nozzle should be inserted when douching the vagina. Its direction from above downwards indicates

FIG. 5.

FIG. 6.
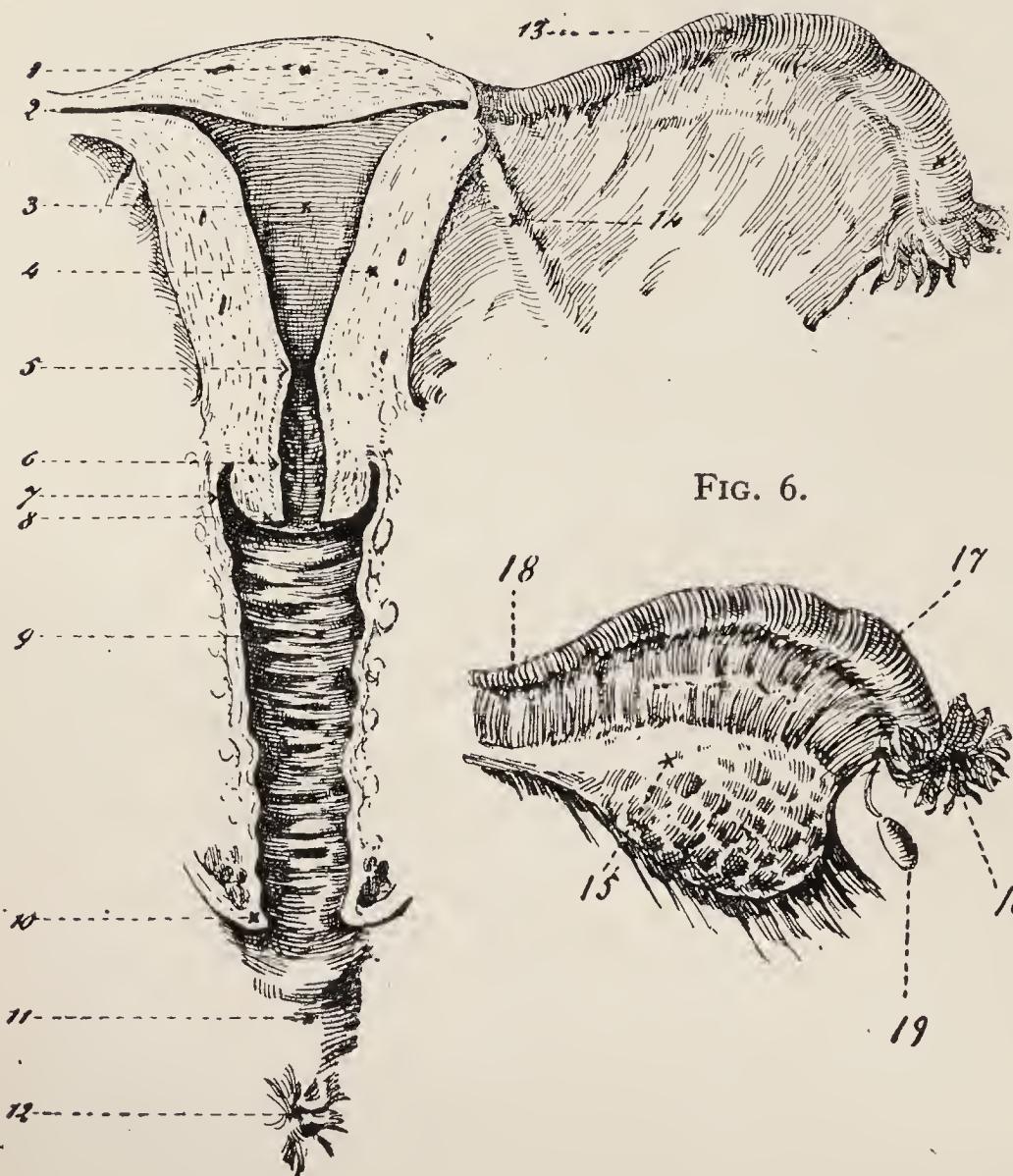
FIG. 5.—UTERUS—VAGINA—FALLOPIAN TUBE.

1. Fundus.
2. Uterine orifice of Fallopian tube.
3. Cavity of the uterus.
4. Uterine wall.
5. Internal os.
6. Cervical canal.
7. Lateral fornix.
8. External os.
9. Vagina.
10. Vulva.
11. Perineum.
12. Anus.
13. Fallopian tube.
14. Round ligament.

FIG. 6.—OVARY—FALLOPIAN TUBE.

15. Ovary.
16. Fimbriated end of the Fallopian tube.
17. Ampullary end of the Fallopian tube.
18. Isthmus of the Fallopian tube.
19. Hydatid of Morgagni.

to the midwife the direction in which she should apply abdominal pressure on the uterus when expressing the placenta in the 3rd stage of labour, after the placenta has entered the vagina. Many a midwife arrives at the conclusion that the placenta is adherent when she applies the abdominal pressure in the wrong direction, that is downwards and backwards.

Relations.—In front the base of the bladder is loosely attached to the upper inch of the anterior wall of the vagina, and the lower 1½ inches of this wall is closely attached to the urethra. Behind, the upper inch of the posterior wall is separated by peritoneum from the pouch of Douglas; the intermediate 1½ inches is separated from the rectum by fascia, and its lower inch is attached to the perineal body. The vagina at its upper end is closed, thus forming a vault. The cervix projecting into it divides this vault into the anterior, posterior and lateral fornices. At the lower end of the vagina is situated the hymen, and at the sides are the free edges of the levator ani muscles. That portion of the cervix above the level of the vault is termed the supra-vaginal portion.

Surrounding the lower end of the vagina is a thin band of voluntary muscle. Rarely this muscle is so sensitive that it contracts spasmodically when a vaginal examination is attempted, also such a contraction may cause pain or difficulty in coitus (dyspareunia).

It is very important that the nurse should remember the relations of the vagina and rectum. Owing to gross carelessness, the douch nozzle may be forced through the vagina into the pouch of Douglas when the douche solution will be injected into the peritoneal cavity and death may result. This catastrophe has happened occasionally, especially when the walls of the vagina are diseased. Again, nurses have been known, when giving an enema, to neglect to fix the india-rubber tube to the end of the bone-nozzle of the enema syringe, with the result that this nozzle has been forced through the rectum, and the enema being injected into the cellular tissue surrounding the rectum has caused an abscess, from the results of which the patient has died.

The Uterus.

The uterus, which is composed of two parts, the body and neck, is a hollow, pear-shaped organ, $2\frac{1}{2}$ inches long, 2 inches broad, and $\frac{1}{2}$ an inch thick. It is composed chiefly of muscle. Its inside is lined with ciliated mucous membrane termed the endometrium, which is a glandular structure and is mostly shed every month, being then renewed to prepare it for the implantation of the zygote (the fertilized oöcyte). The outside is covered by a shiny membrane termed peritoneum, which extends down the back of the uterus lower than in front. The cavity of the uterus contains four openings, two at the junctions of the fundus, where the uterine ends of the Fallopian tubes open, and two below, the internal and external os.

Body (corpus).—Its cavity, which is normally closed, is triangular in shape, $1\frac{1}{2}$ inches long in the virgin, and somewhat longer in a woman who has given birth to a child. That part of the uterus above the insertion of the Fallopian tubes is termed the fundus. In its correct position the body of the uterus looks forward.

Neck (cervix).—Is that portion of the uterus between the level of the internal os and the external, the latter opening into the vagina. It consists chiefly of muscle, and is 1 inch long. Its canal is lined with ciliated mucous membrane, and that part of the cervix projecting through the pelvic floor into the vagina is covered with stratified epithelium, minus its horny layer. With the uterus in its normal position, the cervix points downwards and backwards.

Blood Supply.—There are four arteries, two on each side. The uterine artery arises from the internal iliac artery, one branch of which passes up by the side of the body of the uterus to supply it and to anastomose with the ovarian artery. The uterine arteries as they pass up alongside of the body are coiled to allow of their being stretched as the pregnant uterus enlarges. The branches entering the muscle of the uterus are also coiled, which enables the contraction and retraction of the uterus to clamp them, as it were, which prevents post-partum hæmorrhage during a normal 3rd stage of labour.
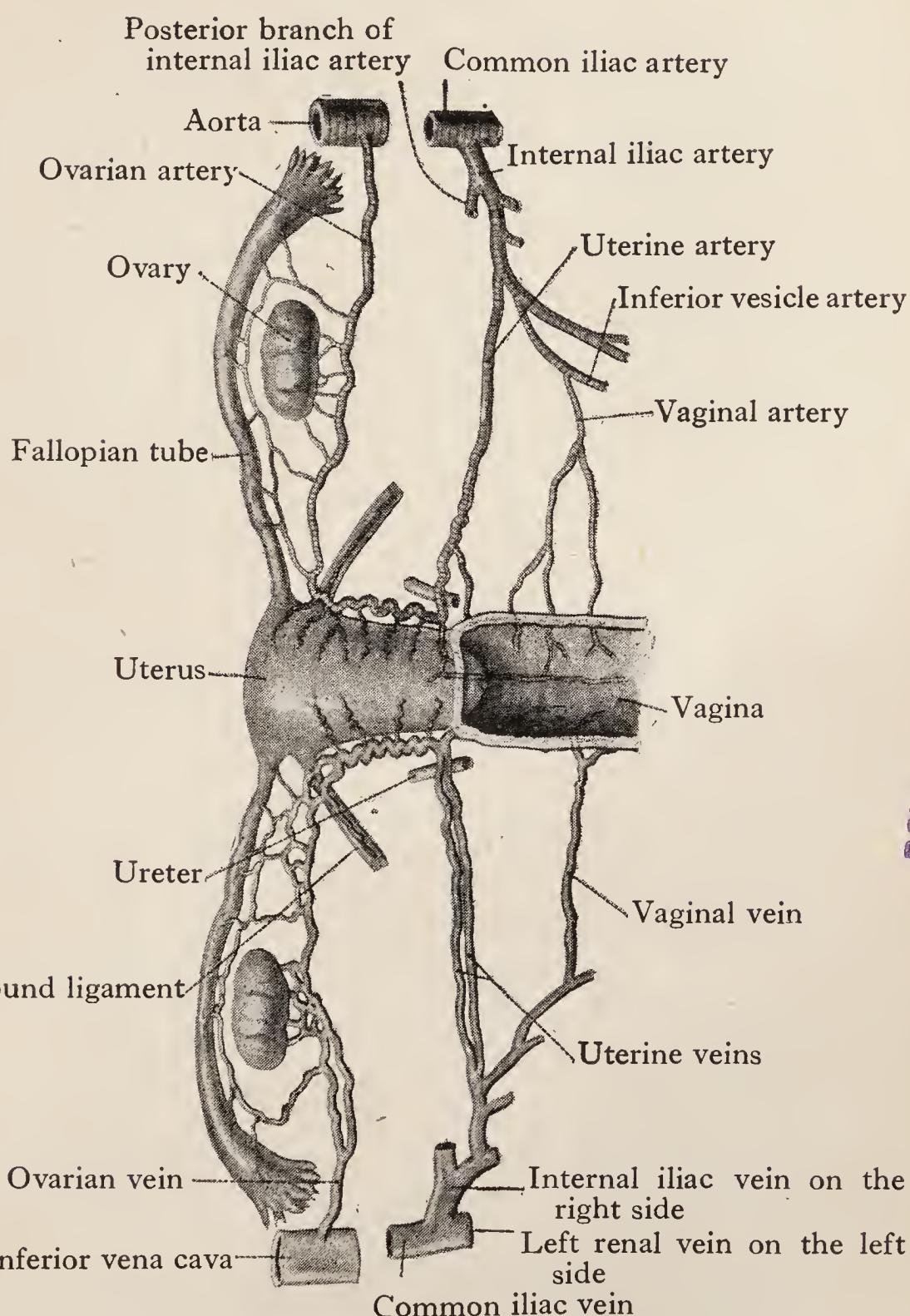
FIG. 7.—CIRCULATION OF THE FEMALE GENITAL ORGANS.

For sake of clarity only the arterial supply is shown on the right side and only the venous supply on the left. It must be remembered, however, that the left ovarian vein joins the left renal vein, and the right ovarian vein joins the inferior vena cava as depicted.

Other branches pass down to supply the neck of the uterus and the vagina.

The ovarian arteries arise from the abdominal aorta and, sending branches to the ovaries, Fallopian tubes, and the fundus of the uterus, anastomose with the uterine artery of the corresponding side.

Veins.—These, originating on each side in the substance of the uterus, combine and form the uterine vein, which joins the internal iliac vein and the ovarian vein. The former on the right side joins the common iliac vein, and so the inferior vena cava, and the latter empties into the left renal vein.

Nerves.—These are derived from the hypogastric plexus near the promontory of the sacrum.

Lymphatics.—These run from the uterus, Fallopian tubes, ovaries, and the upper two-thirds of the vagina to the internal and external iliac glands, and from the lower third of the vagina to the inguinal glands.

Ligaments.—There are eight ligaments of the uterus which help to keep it in its normal position, four on each side. When acting normally, the broad ligaments keep the uterus in its central position, the round ligaments keep the body of the uterus forwards, the utero-sacral ligaments keep the cervix backwards. The uterus is kept at its normal height by the pelvic floor and the cardinal or transverse cervical ligaments, while the intra-abdominal pressure on the intestines also helps by keeping the body of the uterus forward. The broad ligaments are composed of two folds of peritoneum reflected from the back and front of the body of the uterus to the pelvic wall. The round ligaments extend from the body of the uterus just below the Fallopian tubes and pass down under the peritoneum through the inguinal canal to be attached to the top of the labia majora. The utero-sacral ligaments extend from the level of the internal os behind to the sacrum, and the cardinal ligaments pass between the side walls of the pelvis, the cervix and the top of the vagina.

The Pouch of Douglas.—This is the lowest part of the peritoneal cavity, and is situated in the pelvis. It is bounded in front by the supra-vaginal portion of the cervix and upper portion of the vagina, at the sides by the utero-sacral ligaments, and behind by the rectum.

The Ovaries.

The ovaries are the source of the ova and of two hormones, œstrone and progesterone. They are two solid, almond-shaped bodies, $1\frac{3}{4}$ inches long, 1 inch broad, and $\frac{1}{2}$ an inch thick, and are situated one on each side of the uterus behind and attached to the broad ligament near the fimbriated ends of the Fallopian tubes. Each ovary consists of two surfaces and two extremities, the upper or tubal pole, and the lower or uterine pole. Each ovary consists of three parts. A superficial part, the cortex with its covering (tunica albuginea) in which are situated the ripening ova (Graafian follicles); a deep part, the medulla, containing blood-vessels and immature ova, and the hilum through which the ovarian blood-vessels and nerves gain entrance.

The Fallopian Tubes.

These are two tubes, one on each side of the uterus, composed chiefly of muscle and lined with ciliated mucous membrane, which is thrown into folds. They are 4 inches long. The inner length of the tube passes through the muscle of the uterus, and opens near the top of the cavity of the uterus, and is termed the interstitial portion. The narrow part adjacent to the uterus is termed the isthmial portion which then passes into the longest and dilated part of the tube, the ampulla, the termination of which has attached to it finger-like processes termed fimbriæ, composed of the mucous membrane, which guide the oöcyte into the tube. After leaving the uterus, the tube extends for nearly all its length under the top of the broad ligament, so that its upper surface is covered with peritoneum and its lower surface is in contact with the connective tissue contained between the layers of the broad ligament. Just before its termination it leaves the broad ligament and opens into the peritoneal cavity at the fimbriated extremity. The Fallopian tubes are supplied with blood-vessels, nerves and lymphatics.

The Breasts.

The breast is composed of glands, connective tissue and fat. It is well supplied with blood-vessels, nerves and

lymphatics, the latter draining into the axillary and supra-clavicular glands. The greater part of the breast consists of connective tissue and is divided into twenty lobes separated by fat. These lobes consist of lobules containing small cavities, termed alveoli, they are lined with a secreting epithelium which, during pregnancy, secretes a fluid which consists during the first 2 days or so of the puerperium of colostrum, and after this of milk. Each alveolus of a lobule has a small duct to carry away the secretion, and these ducts join up to form a larger duct for each lobe, termed the lactiferous duct, which opens on the surface of the nipple. The nipple is covered by skin, is composed of two sets of plain muscle fibres and contains the lactiferous ducts ; one set of muscles by contracting prevent the escape of milk when the child is not suckling ; the other set empties the lactiferous ducts when the child is suckling. Rarely in a case of pseudo-cyesis, or when the woman has an ovarian tumour, a mucoid fluid can be expressed from the breast.

The Kidneys.

The kidneys are two glandular organs, situated one in each loin. Each kidney is 4 inches long, $2\frac{1}{2}$ inches broad, 1 inch thick, and weighs 4 to 5 ounces. The kidneys are very plentifully supplied with blood-vessels, and their function is in health to extract from the blood, as it passes through them, water and waste products, the latter being harmful if retained in the circulation, and to keep within the blood products for the health of the person. If the kidneys are diseased this function may be partly reversed. Take the case of albumin, for instance, which is an important constituent of the blood. If the kidneys are acting normally the blood, as it passes through them, retains its albumin (protein). If the kidneys are not acting normally, then the albumin in the blood passing through them escapes from the blood into the urine ; a condition of albuminuria. The nurse, however, must realize that albuminuria is not a disease *per se*, but perhaps a sign of disease when albumin is found in the urine.

The Ureters.

The two ureters are muscular tubes, 10 inches long, lined with mucous membrane, and they are supplied with blood
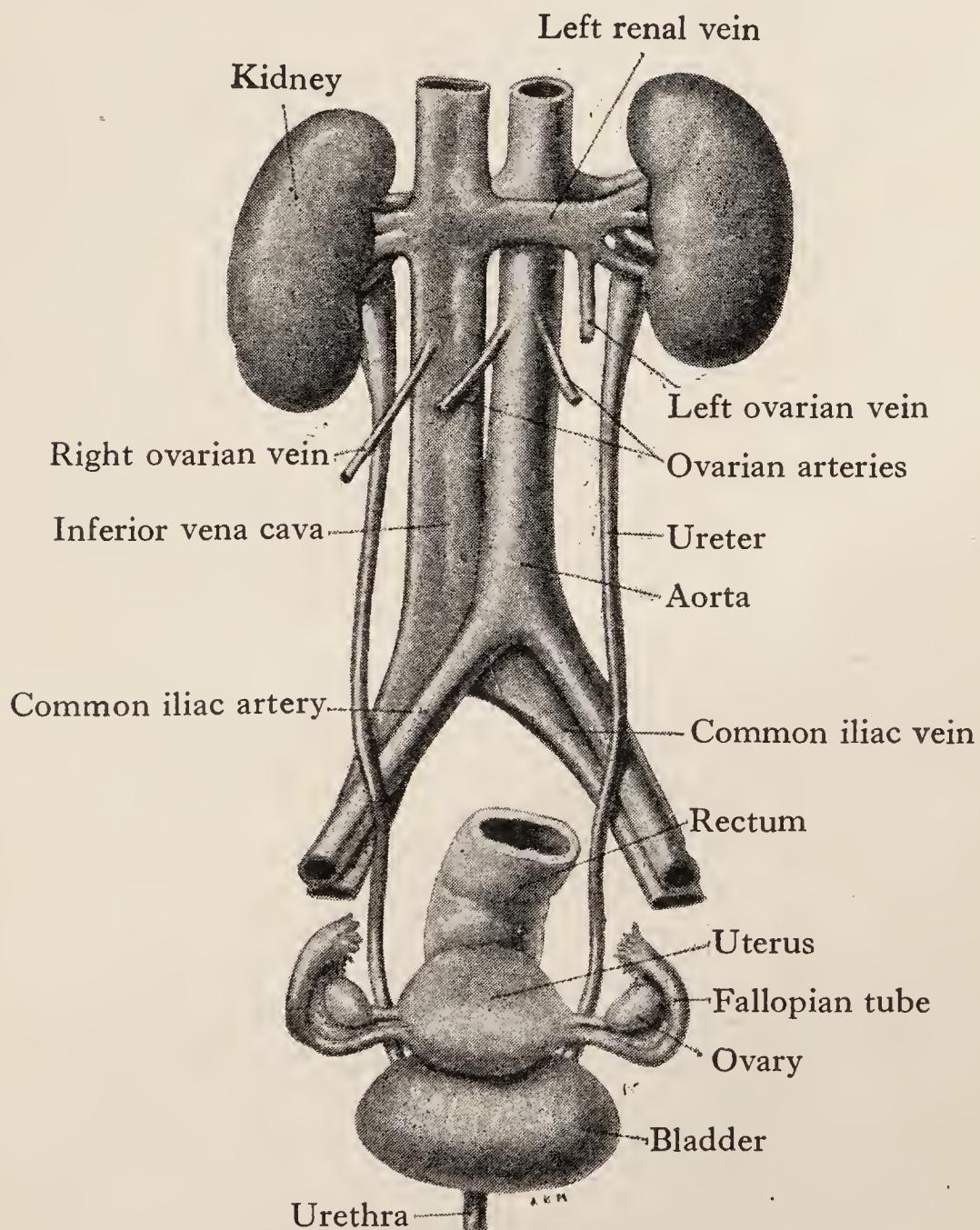
FIG. 8.—URINARY ORGANS.

The relations of the urinary organs to structures in their immediate neighbourhood.

vessels, nerves and lymphatics. The upper end of the ureter is attached to the pelvis of each kidney and the lower end passes through the base of the bladder to open into it.

The Bladder.

The bladder is a hollow organ, composed chiefly of unstriated muscle. It is lined with mucous membrane, and covered with peritoneum, except at the lower part of its anterior surface, and at its base.

Relations.—In front are the pubic bones and the upper part of the vagina. Behind is the uterus. It is supplied with blood-vessels, nerves and lymphatics. When empty, the bladder lies in the pelvis, and as the urine accumulates in it, passing from the kidneys down the ureters, it extends into the abdominal cavity, pushing the uterus somewhat backward, and towards the end of pregnancy the bladder is virtually an abdominal organ. In the complication termed retention of urine, the bladder may rise as high as the umbilicus and, on occasions, it has been known to contain 12 pints.

It will thus be seen that there is a channel, lined with mucous membrane, extending from the vestibule to the pelvis of the kidney, *via* the urethra, bladder and ureters. The knowledge of this will indicate to the nurse the absolute necessity of swabbing efficiently the vulva, including the vestibule, and sterilizing the catheter before passing this instrument. The neglect to take these precautions may lead to infection spreading up to the pelvis of the kidneys, resulting in urethritis, cystitis, ureteritis or infection of the kidney, the latter being, perhaps, the cause of death to the patient.

The Urethra.

This is a muscular tube $1\frac{1}{2}$ inches long. It extends upwards and backwards, closely attached to the anterior wall of the vagina. It is lined with mucous membrane and is supplied with blood-vessels, lymphatics and nerves. Its upper end opens into the bladder and its lower end on to the vestibule, the entrance to the urethra from the bladder being guarded by a sphincter muscle which relaxes when the person wishes to urinate.

The Rectum.

The rectum is a muscular tube, being the last 6 inches of the large intestine. It is lined by mucous membrane, supplied

with nerves, lymphatics and blood-vessels. The last $1\frac{1}{2}$ inches below the tip of the coccyx are bent back, the aperture of exit being termed the anus, which is kept closed, except during defæcation, by a strong sphincter of muscle. Its blood supply comprises the hæmorrhoidal arteries and veins, and the latter if they become varicose are termed hæmorrhoids, which may cause great discomfort during pregnancy or the puerperium.

Relations.—These are important from a nursing point of view. In front the lowest inch is firmly attached to the perineal body, the next $1\frac{1}{2}$ inches is separated by connective tissue from the posterior wall of the vagina. Above this the rectum is separated from the peritoneal cavity (pouch of Douglas) by peritoneum.

In complete rupture of the perineum during labour the lower part of the rectum may be torn, resulting, unless the tear is efficiently repaired, in incontinence of fæces and flatus.

If the rectum is not emptied by aperients, or an enema, before the commencement or, in the case of the enema, at the commencement of labour, fæces containing bacteria are expressed through the anus by the pressure of the advancing head, and so may be the cause of puerperal infection, perhaps resulting in death of the patient.

PHYSIOLOGY.

PART 2.

CHAPTER II.

HORMONES.

To appreciate the action of hormones, which are of a chemical nature, a few elementary observations may be useful.

The Greek word *hormao* signifies to incite, to urge on or to set in motion. Hormones are secreted by certain glandular organs, and act as messengers to other parts of the body, inciting them to perform certain functions. The *rôle* of the hormones in the life-history of the body is difficult to grasp, and whereas the specific hormones of some endocrinal glands have been identified, the remainder have not, and their secretion and action is a matter of surmise.

Glandular Organs with Ducts.—Intestine, kidney, eye, liver, mammæ, pancreas, salivary, sebaceous, testis and uterus.

Glandular Organs without Ducts.—Ovaries, para-thyroid, pineal body, pituitary, spleen, supra-renal, thymus and thyroid.

" The late Little Tich, the popular diminutive comedian, was about three feet nine inches in height. Mochnow, the Russian giant, was nine feet three inches. Why this immense difference ?

" A baby begins life as a tiny fertilized ovum. In nine months it develops into an eight-pound baby. Why does it not develop into a ninety-pound baby in ninety months, or a nine-hundred-pound heavyweight in nine hundred months ? It doesn't. It stops. If the development stops too soon, it becomes dwarfed ; if not soon enough it becomes a freakish giant. Why ?

" How do the leg bones know when to stop growing longer, the skull bones to stop growing larger ? Why does a youth begin to grow a beard ? Why does a boy's voice break ? Why does the development of the sex life proceed so markedly at puberty, during the early 'teens ? Why not at seven or twenty-seven ? You have doubtless experienced such emotional states as fear, pain, anger, rage, horror, sorrow, terror, anxiety, disgust, grief. What makes possible the physical manifestations of these varied emotions ? In rage, your physical strength may be more than doubled for a short time. Why ?

" These are only a few of the physiological puzzles now solved by the science of endocrinology." *

Moreover, the growth and well-being of the body require the correct action and interaction of the various glandular organs, any increase or decrease in the action of these glands leading to ill-health.

Endocrinal Glands (from the Greek word *endo*, within, and *krino*, I separate).—These are the glands which secrete the hormones. The original definition of an endocrinal gland was one having a glandular structure, well supplied with blood-vessels, but not having any duct. It is now known, however, that this definition is not sufficiently complete, since bio-chemists contend that there are other glands with ducts which secrete hormones. Examples of the latter are the pancreas, stomach and testis, and it is probable that more of a similar nature will be discovered.

There is an interdependence between the endocrinal glands so that a correct balance is maintained between their hormones and the requirements of the healthy body. This interdependence is well exemplified between the anterior lobe of the pituitary and thyroid glands, and the thyroid gland and the ovaries. There being a greater demand on the metabolism of the woman during menstruation and throughout pregnancy, the ovarian hormones play a leading part and also the thyroid enlarges, whereas at the cessation of menstruation and ovulation (menopause) the thyroid gland becomes smaller.

The known facts regarding the action of certain hormones

* "Glands of Destiny," Dr. Milton Powell, Health Culture, New York.

have been elicited by a consideration of the results following the ablation of certain endocrine glands (operative, experimental), by the results obtained by the administration of chemically prepared hormones after these glands have been removed (œstrone, throxin), and by the investigation of diseases resulting from hypertrophy or atrophy of some endocrinal glands. The master endrocrinal gland is the pituitary, which is very remarkable, in view of the fact that it is extremely small, weighing but 0·5 gram, and the large number of hormones it prepares. The pituitary is situated in a small hollow on the sphenoid bone, one of the bones of the base of the skull, and consists of two parts, an anterior and posterior lobe united by an intermediate part, its secretions being carried to various organs of the body by the blood-stream. Thus :—

Hormones of the Anterior Lobe.—

These hormones regulate—

> The growth of the body.
> The metabolism of the body.
> The sex functions (gonadotropic).
> Certain parts of the pancreas.
> The thyroid.
> The supra-renal.
> The parathyroid.
> The secretion of milk (galactogogue).

Hormones of the Posterior Lobe.—

These hormones regulate—

> The blood-pressure (pitressin).
> The contraction of unstriated muscle (pitocin).

It is presumed that the above hormones are produced in these respective glands, since in them the greatest concentration is found.

Presuming that the State Registered Nurse will have received in her training an elementary tuition in the action of the various hormones in general, in this book we are mostly concerned with those having relation to puberty, menstruation, pregnancy and the menopause.

Female Sex Hormones.

Gonadotropic.—This, as has been stated, is prepared by the anterior lobe of the pituitary, and is termed *prolan*. Whether there is included in this term one hormone or two is uncertain, but the evidence inclines to the view that there are two, since one extract, termed prolan A, regulates the maturation of the ovarian follicles, and the other extract regulates the luteinization of the corpus luteum, termed prolan B. Gonadotropic material obtained from the urine of pregnant women is now termed chorionic gonadotropin by International agreement. The quantity in the urine is greatly increased in the diseases of hydatid mole and chorion epithelioma.

Ovarian.—From the anterior lobe of the pituitary gland chemical stimuli pass to the ovaries inciting them to produce two hormones, œstrone and progesterone ; œstrin and progestin being the secretion products respectively.

Œstrone.

1. Incites menstruation and is concerned in the regeneration of the nutritional part of the endometrium which is cast off during menstruation, or if the oöcyte is fertilized which forms the decidua.
2. It is responsible for the secondary sexual characteristics at puberty, including the growth of the uterus, Fallopian tubes and vagina.
3. If the woman becomes pregnant, then the production of œstrone is much greater.
4. It stimulates the Graafian follicles to ripen (ovulation).
5. It incites œstrus.

Progesterone.

1. Completes the development of the nutritional part of the endometrium, leading to increased secretion of its mucous glands and the storage of glycogen, so as to prepare the endometrium (decidua) for the reception and embedding of the zygote.
2. It protects the stability of the zygote and so prevents the uterus from contracting strongly as it does in labour or abortion. If the corpus luteum of a human

female is destroyed after rupture of the Graafian follicle menstruation follows within 36 to 48 hours, at least 10 days before it is due.

3. It prevents the incidence of menstruation.
4. It prevents ovulation.
5. It stimulates the growth of the glandular tissue of the breasts during pregnancy.

Progesterone cannot act without the assistance of œstrone since the latter has to commence the regeneration of the endometrium, nevertheless it will be noted that their actions are otherwise antagonistic.

The above are naturally occurring hormones. For therapeutical purposes synthetic hormones are now prescribed. In the case of œstrone, Stilbœstrol which is very active when administered orally. In the case of progesterone, Stigmasterol administered by injection intramuscularly.

Placenta.—This organ secretes chorionic gonadotropin.

Posterior Lobe Hormones.—

Although these are not female sex hormones, nevertheless pitocin incites the uterus to contract during labour, when the antagonistic action of progesterone has waned. The injection of pitocin is one important method of treatment in postpartum hæmorrhage.

Commercially chorionic gonadotropin is obtained from the urine of mares, since it contains a vastly greater quantity than the urine of the human female.

CHAPTER III.

PUBERTY. MENSTRUATION. DEVELOPMENT OF THE GRAAFIAN FOLLICLE. MENOPAUSE.

Puberty.

THE onset of puberty is indicated by the appearance of menstruation, and signifies that the ovaries and uterus have become active. Puberty is essentially one of race characteristics, and is usually earlier in females living in warm climates than in those in which the climate is cold. In Great Britain 14 is the average age for the onset of puberty.

The marked changes in the development, behaviour and temperament of the girl at puberty is due to the incidence of the ovarian hormones, and such changes are so well known to all women that they need not here be discussed.

Menstruation.

The menstrual cycle is comprised within 28 days. Starting from the termination of the last period, and presuming the latter to last 5 days, there are two stages, the premenstrual and menstrual. The cervix is not involved.

Premenstrual Stage.

From the 1st to the 14th Day.

The superficial portion of the endometrium is cast off and the remainder is regenerated, due to the influence of œstrone. At the end of this stage ovulation occurs.

From the 15th to the 23rd Day.

Under the influence of progesterone the regenerated endometrium increases in thickness and reaches its full development, so that its structure approaches that of the decidua of
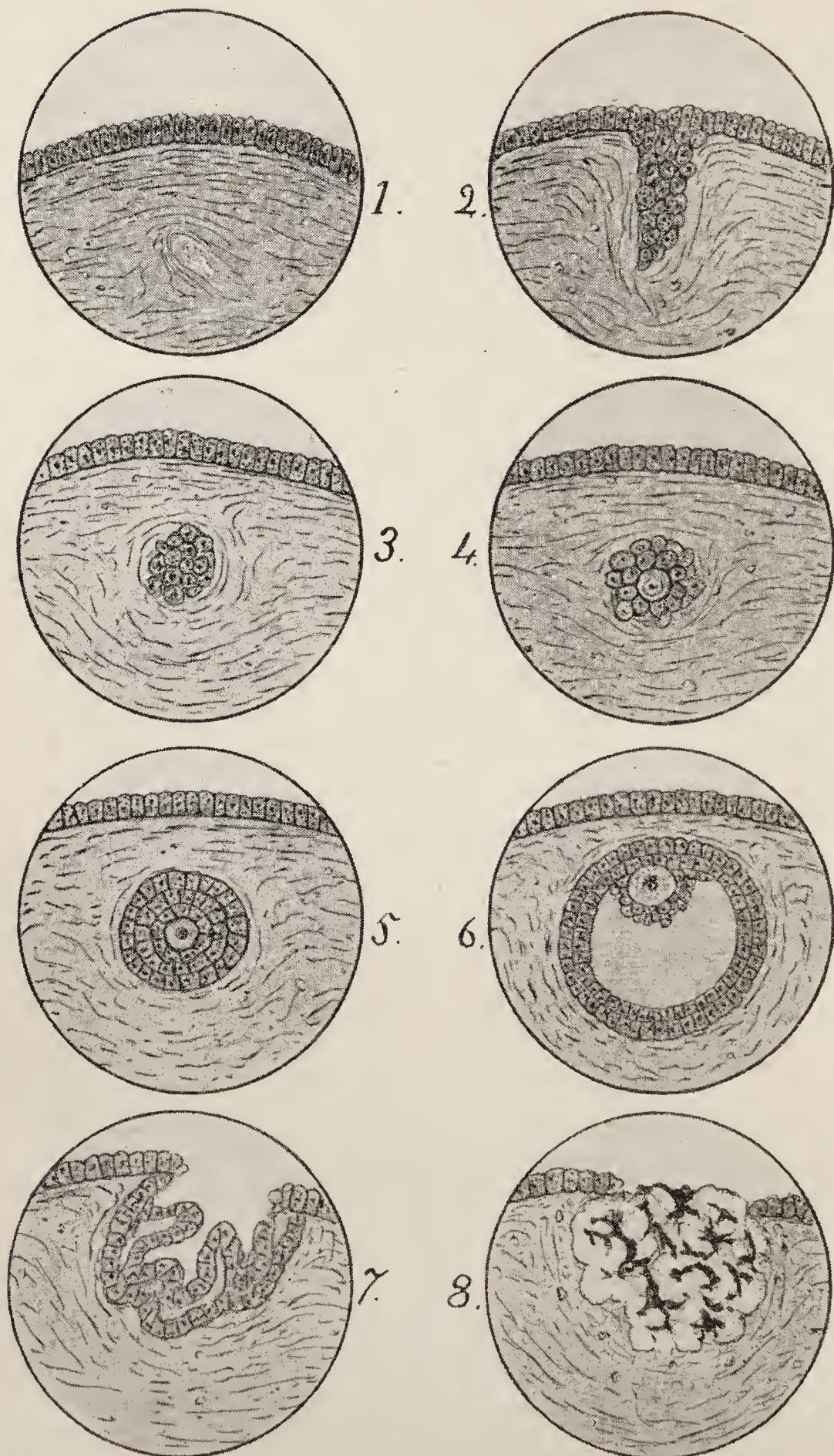
FIG. 9.

a pregnant woman and is, therefore, sometimes termed the menstrual decidua. In other words, the endometrium has been prepared for the reception and embedding of the zygote.

Menstrual Stage.

From the 23rd to the 28th Day.

The superficial portion of the endometrium now necroses owing to the waning influence of the progesterone, and the uterus contracting expels the *débris* of the superficial portion, together with blood from the torn capillaries, cells, and discharge from the mucous glands, thus menstruation ensues.

The average duration of menstruation is 5 days, though it may be shorter or longer in any particular, otherwise normal, person. The average amount of the period is 5 ounces, and in arriving at a decision as to whether menstruation in any particular female is normal or otherwise, account must be taken of the duration and amount lost at the period which have been normal to her in health. Thus, except in special cases, in an endeavour to ascertain whether the amount lost is greater than the woman is in the habit of losing, by estimating the weight of the diapers used during menstruation with an equal number of unused diapers of a similar kind, it may be taken that the average woman of cleanly habits uses eight to ten diapers during her period. Any marked increase in the number of diapers used in the duration of menstruation, or the presence of clots, which are

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FIG. 9.—Diagrammatic representation showing the formation of a primordial ovum.   1. Germ epithelium covering the surface of the ovary.   2. Pflüger's egg-tube growing down into the ovarian substance.   3. Egg-tube cut off from germ epithelium of the surface of the ovary forming a primordial follicle, and the maturation and ovulation of a Graafian follicle at and after puberty.   4. Formation of the oöcyte, or ovum, by one of the cells of the primordial follicle becoming larger than the rest.   5. Formation of the rest of the cells into the membrana granulosa.   6. Liquefaction of some of the cells of the membrana granulosa so that a follicle is formed lined by two or three layers of cells of the membrana granulosa, the ovum being surrounded by cells and attached to one part of the lining.   7. The follicle has ruptured, the ovum has escaped and the collapsed lining (membrana granulosa) is thrown into folds, the cells become filled with a yellow pigment and the corpus luteum is formed.   8. Corpus luteum.

expelled during micturition or defæcation, is an indication that the periods are excessive. It is stated that fibrin ferment does not escape from the blood during normal menstruation, but when the loss is excessive it does, and this accounts for the presence of clots.

Menstruation is, except in the more fortunate, accompanied by more or less worrying symptoms. It is important, however, that young women should be taught to regard menstruation as a physiological process which they will have ' to put up with,' and it should not be allowed to interfere with their usual activities. Otherwise, undue concentration on menstruation tends to the incidence of dysmenorrhœa and some nervous symptoms.

Development of the Graafian Follicle.

The ovary is covered by a single layer of cells termed the germ epithelium. During late fœtal life small processes of this germ epithelium bud down into the substance of the ovary, which buds are cut off by certain other cells, the separated portions being termed cell nests. Certain changes take place in the cell nests, the resulting structures being termed *primordial follicles*, which are not formed after birth.

The majority of these follicles do not undergo further development, but a certain number do so. One of the cells of the primordial follicles grows larger than the rest, and is termed the *oöcyte*. The remainder of the cells increase in number and surround it, and some liquefy, so that a *Graafian follicle* is formed. Of the surrounding cells, those nearest the oöcyte form a layer termed the *membrana granulosa*. Outside this layer two others are formed, an internal, or *tunica vasculosa*, which is vascular, and an external termed the *tunica fibrosa*.

Maturation.—In the nucleus of all varieties of cells there are minute rod-like structures termed chromosones, of which each species has its own particular number, and which are thought to be the source of the hereditary characteristics of the species and, perhaps, they play some part in the determination of sex.

The nucleus of the female reproductive cell (oöcyte) contains 48 chromosones, with maternal characteristics. The

nucleus of the male reproductive cell (spermatazoon) also contains 48 chromosones with paternal characteristics. Since the fertilized cell (zygote) will only contain 48 chromosones with maternal and paternal characteristics, half the maternal and half the paternal chromosones, on the fusion of the two reproductive cells, are got rid of. This stage of development, which is termed maturation is an intricate process which need not here be dealt with.

Ovulation.—As the amount of fluid increases, the Graafian follicle rises to the surface of the ovary and the tension of the fluid eventually bursts the surface. The oöcyte being discharged into the peritoneal cavity (ovulation) is either gathered by the fimbriated end of the Fallopian tube for conveyance to the uterus, or failing this, disintegrates and dies.

Formation of the Corpus Luteum.—The cavity, due to the escape of the oöcyte and liquid of the Graafian follicle, is then filled with blood escaping from the capillaries of the tunica vasculosa and the proliferating membrana granulosa, the cells of which contain a yellow pigment, the corpus luteum being formed, hence its name. The further history of this depends upon whether the oöcyte is fertilized or not. If the woman becomes pregnant, the corpus luteum continues to increase in size for 12 weeks, and then persisting throughout pregnancy atrophies after the birth of the child. If the woman is not pregnant, the corpus luteum atrophying, is replaced by the corpus albicans.

Menopause.

This, the climateric or change of life, occurs in the majority of women between the ages of 45 and 50, although it may occur earlier or later. Its method of advent varies so that in some women menstruation fails to recur when expected and never again appears. More commonly menstruation varies in its regularity and the amount lost at the period, the intervals between the periods becoming longer, so that several weeks or months may elapse before the appearance of the next and, perhaps, the last menstruation, while on the other hand, the frequency, for the time being, may be increased. The same irregularity in the amount of blood

lost may be noticed, in some the quantity becoming progressively less, in others there may be one or more profuse hæmorrhages.

It is the bounden duty of every nurse, if she is informed by a woman that the latter has irregular or profuse losses of blood from the vagina, to advise her at once to seek medical advice and insist on being examined internally. While it is true that such losses may occur at the menopause, due to abnormal endocrine action, nevertheless, in a large proportion of cases such losses are due to disease of the uterus or vagina, including cancer. Women so often presume, or are told, that excessive loss at the menopause is normal, and either neglect to seek medical advice or, having done so, some doctors arrive at the same conclusion and fail to examine internally the patient. Cancer of the uterus can only be detected by a vaginal examination or by an exploration of the body of the uterus, any tissue removed therefrom being microscopically examined. The result is, as I have had the sad reason to know from an experience of many years as Consulting Gynæcologist to the London County Council, that many women postpone seeking such advice, or not having had the correct advice, only apply for relief when their chances of cure are infinitesimal.

Accompanying the menopause, certain well-recognized symptoms usually appear. Thus the woman may complain of hot flushes, cold perspirations, giddiness, nausea, vomiting, dyspepsia, irritability, headache, neuralgia, backache and pains in various parts of her body. There may be a disinclination for exercise, and she may become stouter. Her mental outlook may become strained, she may take to drink to drown her worries, she may accuse her husband of being unfaithful or of neglecting her, she may talk of committing suicide, and sometimes does so. It is also true that her mental outlook may be such that, without realizing its enormity, she will steal articles from shops. That this thieving is due to the menopause will always be stressed by the defending counsel and, fortunately for the defendant, the magistrate will often agree. The menopause is not necessarily, or always, an incitement to crime.

Treatment.

As a rule, the patient should be advised to regard the menopause as a physiological process. At the same time it will be advisable to impress upon a husband that he may have to 'put up with all sorts of trials and fancies' on the part of his wife. He should, therefore, treat her with becoming sympathy since the menopause may be a far greater trial to his wife than to himself.

If the nervous symptoms are mastered the doctor will prescribe sedatives and œstrogenic compounds. If the hæmorrhage is abnormal the doctor, having ascertained by a correct examination the absence of disease, can arrest the bleeding by the application of radium.

PREGNANCY AND PARTURITION.

PART 3.

CHAPTER IV.

FERTILIZATION. DEVELOPMENT OF THE ZYGOTE. THE PREGNANT UTERUS. THE PLACENTA, CHORION AND AMNION. THE UMBILICAL CORD. THE FŒTAL CIRCULATION.

Fertilization.

ALTHOUGH many women become pregnant with every opportunity, it is interesting to realize that it must, in a way, be somewhat difficult for a woman to become pregnant, since from 300,000,000 to 600,000,000 spermatazoa are ejaculated at each coitus, and the oöcyte requires only one spermatazoon to fertilize it.

This consists in the fusion of a male (spermatazoon) and female (oöcyte) reproductive cell. The spermatazoa, which are developed in the testes, being deposited in the vagina, by their own movements, probably aided by the suction of the uterus at the moment of their deposition, pass through the external os along the cervical canal and cavity of the body of the uterus into the Fallopian tubes. One spermatazoon (occasionally more) coming in contact with one oöcyte (occasionally more, twins and so on) loses its tail and its head fuses with the oöcyte, the zygote being thus formed. That such a fusion normally occurs in a Fallopian tube is assumed, since not only is this the normal site in mammals other than human, but also there is a complication of pregnancy termed tubal gestation, which is a proof, in such a case at any rate, that the fusion took place in the tube.

The term ovum is used indiscriminately by some authors to indicate the egg in the ovary, the fertilized egg and the

gestation products in the uterus in their early stages. In this book the term oöcyte is taken to indicate the unfertilized egg, that of zygote when the oöcyte is fertilized, and the term ovum is reserved for the placenta and fœtus in their early stages of development.

Development of the Zygote.

On its journey through the Fallopian tube the single-celled zygote divides, so that at first a solid mass of cells are formed,
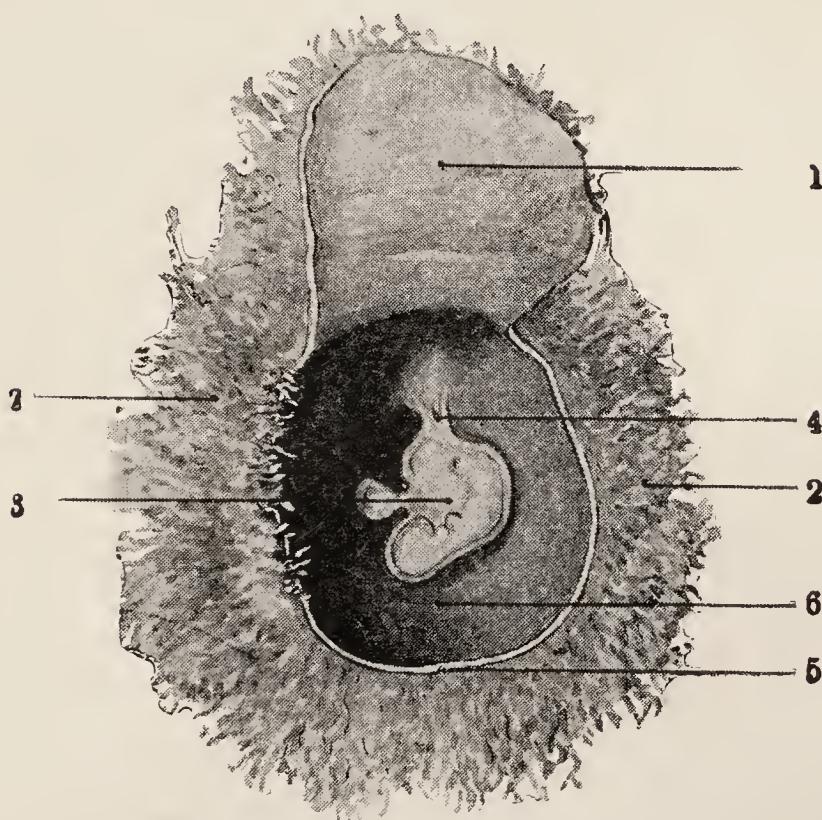
FIG. 10.—The developing blastocyst before the formation of the placenta. A flap has been raised so as to show the interior. 1. Flap raised; 2. Chorionic villi; 3. Embryo; 4. Umbilical cord; 5. Amnion; 6. Liquor amnii.

termed *the morula* (mulberry), and then some of the cells in its centre liquefy, forming a cyst, termed the *blastocyst*. By the time the blastocyst reaches the cavity of the uterus it is covered by outgrowths from its external layer of cells, termed *primitive chorionic villi*, and it is by the action of these that the blastocyst is able to invade the decidua.

The outer layer of cells of the blastocyst in due course form the *chorion* and *chorionic villi*, and the remainder of the

2

cells (embryonic cell mass) are the source of the various structures of the body of the fœtus.

The Pregnant Uterus.

Increase in Length.—To accommodate the growing fœtus, the cavity of the uterus must obviously enlarge, which
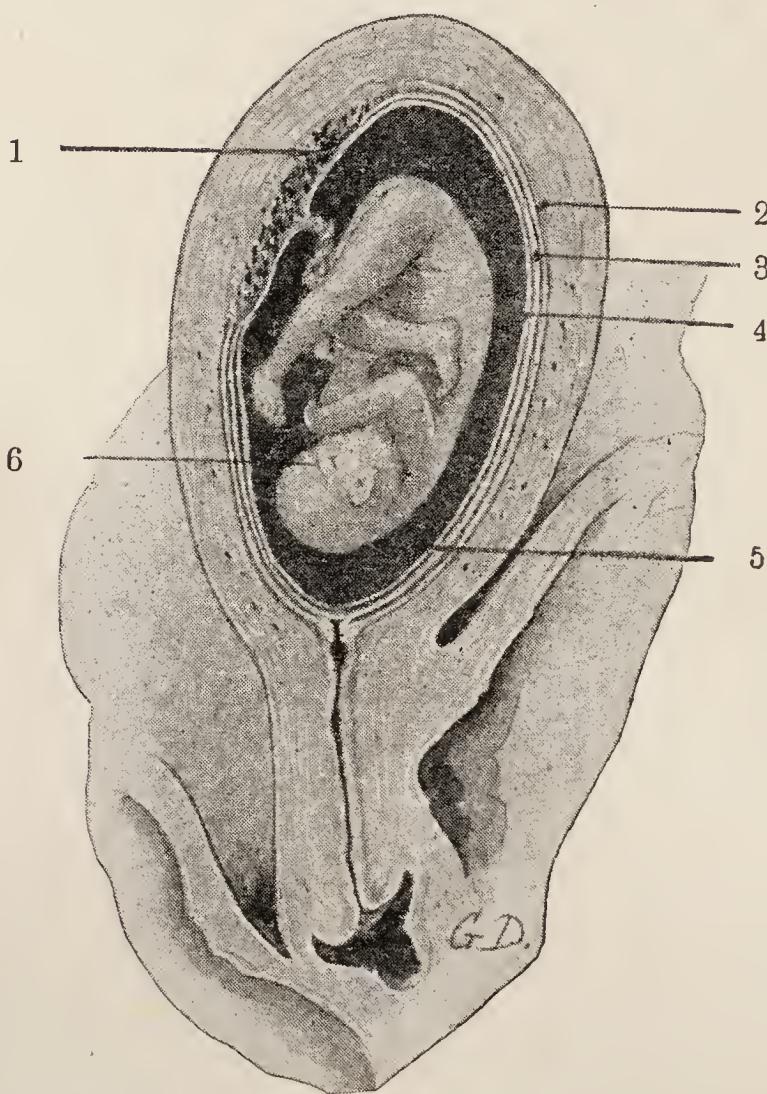
FIG. 11.—Contents of the pregnant uterus after the 12th week.   1. Placenta ;   2. Decidua ;   3. Chorion ;   4. Amnion ;   5. Liquor amnii ;   6. Fœtus.   The three membranes are purposely shown separated in the diagram : they are, as a fact, united to one another. As the fœtus grows, the decidua capsularis and vera become compressed, so that at term very little of them remains, what there is appearing as patches of reddish shreds.

thus increases in length from 2½ to 12 inches, so that its upper border is felt above the symphysis pubis ; at 16 weeks it is

4 inches above the symphysis and touches the abdominal
wall, at 24 weeks level with the umbilicus, at 30 weeks half
way between the umbilicus and ziphisternum, at 36 weeks at
the ziphisternum, and during the last 2 weeks it sinks some-
what, due to the head of the child engaging in the pelvis.
Such measurements, however, vary, according to the amount
of fat in the abdominal wall and whether the woman is a
primigravida or multipara.

Hypertrophy of the Muscle Coats.—Three layers of
muscle can be demonstrated in the pregnant uterus: an
outer layer which is longitudinal, and is mostly concerned with
expressing the child at birth; a middle layer of interlacing
fibres which surround the coiled branches of the uterine
arteries and when contracting and retracting prevent post-
partum hæmorrhage (living ligatures); and a circular layer
surrounding the body which raises the intra-uterine pressure
during labour, and surrounding the cervix which keeps the
cervical canal closed during pregnancy. The muscles in the
lower part of the uterus do not hypertrophy so much as those
in the upper part of the uterus, and this becomes evident
during labour by the formation of the upper and lower
uterine segments. These two segments differ markedly
in their action, since in labour, while the upper segment
contracts and retracts, the lower segment is stretched.

Changes in the Endometrium.—Certain changes occur
in the endometrium when the oöcyte is fertilized, the lining of
the uterus being then termed the *decidua*, with reference to
the leaves of a deciduous tree which are cast off; most of the
decidua is cast off during and following the birth of the child.
To put it briefly, the decidua becomes much thickened and
softer, and four layers can be distinguished. Nearest the
cavity of the uterus is the compact layer composed of millions
of small cells closely packed together with the ducts of the
glands running through them, the object of this layer being to
prevent the zygote escaping from its bed in the decidua into
the muscle of the uterus. Next a spongy layer due to a
great increase in the length of the glands. Next the postage-
stamp layer, so-called because the lumina at the ends of
the glands are somewhat dilated, so that the maternal placenta
can be easily separated at this layer, just as the perforations

of a sheet of postage stamps lead to their easy separation, and lastly, the layer attached to the muscle of the uterus, which has the structure similar to that of normal endometrium.

Blood-vessels, Nerves, and Lymphatics.—There is a marked increase in these which, together with the hyper-trophied muscle, leads to an increase in weight of the uterus from 2 ounces to 2 pounds after the 3rd stage of labour.

The Placenta.

The placenta consists of a maternal and fœtal portion, so bound together that they cannot be separated. The maternal portion consists of four layers of the decidua, and the fœtal portion of the chorion, chorionic villi and amnion. The placenta secretes a gonadotropic substance termed chorionic gonadotropin found in the urine (A-Z test).

Maternal Portion.—In the course of burrowing into the spongy portion of the decidua, the chorionic villi open up small arteries in their neighbourhood, which are the ter-minations of the spiral arteries of the body of the uterus. The blood thus escaping forms blood-lakes, or intervillous spaces as they are correctly termed. The venous blood in the intervillous spaces is removed by veins continuous with the uterine veins.

Fœtal Portion.—The chorionic villi are of two varieties, anchoring and nutritional. The anchoring villi penetrate through three layers of the decidua, and are embedded in the fourth layer, that nearest the uterine muscle, thus forming, as it were, a series of girders to keep the whole placenta securely fastened to the uterus.

The nutritional villi, of which there are vast numbers, project freely into the intervillous spaces, and are thus bathed with blood. The villi contain minute branches of the um-bilical arteries and vein with extremely thin coats, the villi themselves being covered with a very thin layer of tropho-blast. Thus, although the maternal blood and fœtal blood do not mix, the coverings of the blood-vessels and of the villi are sufficiently thin to allow nutrition to be absorbed from the maternal arterial blood in the intervillous spaces and waste products to be removed therefrom by branches of the uterine veins.

The Chorion.

The chorion, which is the outermost of the two fœtal membranes, is more opaque, thicker, but not so tough as the amnion. The blastocyst having come to rest, the chorionic villi increase greatly at one pole, forming part of the fœtal placenta, and the remaining villi atrophy.

The Amnion.

This, the innermost membrane, is smooth, thin, tough, shiny and transparent. It passes over the fœtal surface of the placenta, from which it can be separated up to the insertion of the umbilical cord. It lines the cavity containing the fœtus and liquor amnii.

The Liquor Amnii.

The liquor amnii consists mostly of water containing inorganic salts, albumin and urea in small quantities. At term it measures on the average 2 pints. The liquor amnii allows the fœtus to exercise, prevents loss of fœtal heat and injury due to external blows on the mother's abdomen. During labour the liquor amnii in the bag of the membranes assists in dilating the cervix.

The Umbilical Cord.

This, on the average, is 20 inches long, and extends from the fœtal surface of the placenta to the abdomen of the fœtus, at the spot where the umbilicus will eventually be found. It contains two arteries and one vein.

The Fœtal Circulation.

It is interesting to note that the arterial blood flowing into the fœtus *via* the umbilical cord does so through the umbilical veins, while the venous blood flowing out of the fœtus *via* the umbilical cord does so through the umbilical arteries. Exactly the opposite to that which obtains after birth, when arterial blood flows through arteries and venous blood through veins.

Growth of the Fœtus.

The growth of the fœtus is extremely rapid, as evidenced by the fact that from a single cell of about 100th of an inch in diameter, at term it measures 20 inches long and weighs on the average 7 pounds, the zygote being too light to weigh even if one could be obtained. As a rule, males are somewhat heavier than females, and the weight of the child tends to increase with successive pregnancies.

CHAPTER V.

ANTENATAL CARE AND TREATMENT.

ALTHOUGH a State Registered Nurse, unless she is a midwife, will not have the care of a woman during her pregnancy, a short description of antenatal care, and treatment when necessary, is here included. Such care is so vitally important that, although a State Registered Nurse may not be intimately connected with it, in the course of her practice she may have many opportunities of impressing this importance on expectant mothers.

Antenatal care and treatment is an extremely important part of preventive medicine. It aims at the maintenance of the health of the pregnant woman ; ensures, so far as possible, the normal delivery of an uninjured and healthy child and the promotion of a normal puerperal period, so that the woman may be able to nurse her child and resume her ordinary duties without disability.

It may truly be said that the future of the nation is wrapped up in antenatal care. It is the experience of most medical men that the percentage of serious complications of pregnancy and labour have notably decreased since antenatal care and treatment has been established. Apart from private practice, in which all doctors should give their pregnant patients very special care, there is the hospital class of patient, and unfortunately many such women do not live near a hospital and so cannot attend one for antenatal advice. This difficulty has been met by the establishment of Antenatal Centres in most towns in the United Kingdom to which any woman who applies is cordially welcomed.

At these Antenatal Centres the general health of the patient is gone into, the history of any previous pregnancies, labours and puerperia, if any, is noted ; the throat, teeth, lungs and heart are examined ; the abdomen is palpated, a vaginal examination is made and the pelvis is measured, also the urine is tested and the blood-pressure taken. The number of antenatal visits necessary will depend on the doctor's advice.

It may be that a State Registered Nurse will be asked by an acquaintance advice on the following :—

Baths.—Certain amounts of waste products are excreted by the sweat glands of the skin, and since dirt may occlude the orifices of the ducts of these glands it is important that a pregnant woman, if possible, should have a warm bath every day, preferably before going to bed. That such waste products, if not excreted, are deadly is proved by the fact that if a rabbit is varnished it dies, which also was the end of a small boy who took the part of Cupid in a tableau at a celebrated ball in Paris. To make his appearance more striking, he was covered with gold leaf, and as a result thereof he died in convulsions.

When taking her bath, the woman should wash all over with plenty of soap, paying special attention to the vulvo-perineal region, since bacteria, which may be the cause of puerperal sepsis, are found in such a situation. If it is impossible to obtain a daily bath the necessity for a daily washing of her body should be stressed.

Diet.—It is very important that a pregnant woman should take a well-balanced diet, both on her own account and that of her unborn child. Her food should be as digestible as possible, and should contain a correct amount of salts and vitamins, and she should drink plenty of water and milk.

Dress.—Her clothing should be comfortable and adequate, and of such a texture that air can penetrate and perspiration be absorbed. Nowhere should it be tight, and her boots should have low heels.

Exercise.—She should lead a healthy, and as quiet a life as possible, obtaining plenty of fresh air and walking exercise daily, short of fatigue. Dancing, cycling, golfing, riding, driving a motor-car, the use of the treadle sewing machine should be avoided. Some women appear to be quite reckless in their activities when pregnant. I knew of a woman who hunted one day and had a normal labour the next.

Nipples.—In order that the child should be fed by the breast, the great importance of which is universally acknowledged, the nipples must receive special attention during pregnancy, otherwise they may become sore and breast feeding have to be abandoned.

Regulation of the Bowels.—The bowels should act daily so as to get rid of the waste products in the large intestine. Although the strongest purgatives will fail to induce abortion in most women, in a few this complication results. If, therefore, a regular action of the bowels cannot be obtained by the use of fresh fruit, plenty of vegetables at meals, and a glass of hot or cold water before breakfast, senna pods, liquorice powder or cascara sagrada may be taken. If the woman suffers from constipation she should obtain medical advice.

Mouth and Teeth.—These should receive daily attention, and a pregnant woman should consult a dentist, either privately or at an Antenatal Centre, where such advice in many cases can be obtained. Bacteria, the cause of puerperal sepsis, are to be found in the mouths of many people, and it has been proved that they have often been the cause of puerperal sepsis. In such cases the bacteria are conveyed in the spray emanating from the mouth during coughing, laughing, speaking or sneezing. It is for this reason that every doctor and midwife attending a case of labour should wear a mask. Very rarely the woman may infect herself through the medium of her pocket handkerchief.

Sexual Relations.—In women who have had one or more abortions, coitus during pregnancy increases the risk of a recurrence. Since one cause of puerperal sepsis has been proved to be due to the deposition of bacteria into the vagina during coitus, the latter should be avoided during the last 6 weeks of pregnancy.

Urine.—The urine should be tested when the woman first engages her doctor; then every 4 weeks to the 32nd week, every 2 weeks to the 36th week and after every week to term. One of the earliest signs of pregnancy toxæmia may be detected by such an examination. Since the doctor may, because of his many duties, fail to remind the patient that such testing is very important, she should send, or take, to him a specimen on these dates. This will obviate any acrimonious discussion.

Throat and Tonsils.—On any complaint of sore throat, a doctor should be consulted. Probably the commonest cause of puerperal sepsis is droplet infection.

Antenatal care and treatment is dealt with efficiently in textbooks on midwifery.

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CHAPTER VI.

THE THREE STAGES OF LABOUR.

PARTURITION, which starts with the dilatation of the cervix and ends, normally, with the expulsion of the placenta and membranes, is divided into the 1st, 2nd, and 3rd stages. Concerned in the mechanism of labour there are three factors, the uterine and auxiliary muscles, the child, and the placenta and membranes. The mechanism of a normal labour only will be dealt with here in a summarized manner, but sufficient to indicate to a nurse, who is not a midwife, what to do if she is called in suddenly to such a case. For a detailed account of labour and its efficient management, a nurse who is interested can refer to the author's " Handbook of Midwifery for Midwives and Obstetric Dressers " (Cassell & Co. Ltd., 11th edition).

Indications that Labour has Started.—The first symptom is, generally, pain. True labour pains are regular, felt in the region of the sacrum and increase in frequency and severity, during which the uterus can be felt to contract on abdominal examination. Such pains are accompanied by ' the show ' which consists of mucus slightly stained with blood.

First Stage of Labour.

Labour starts with dilatation of the cervical canal.

Membranes.—When the cervix dilates, the pressure on the membranes (chorion and amnion) in the neighbourhood of the internal os becomes greater, because these are now unsupported. The result is that the lower pole of the membranes gradually becomes separated from the lower uterine segment, and projecting into the cervical canal forms the bag of membranes, this together with the action of certain muscles of the uterus helping to dilate the cervical canal.

Action of the Muscles of the Uterus.—This will be a convenient place to describe the action of the uterine muscles,

since their action differs somewhat in the three stages of labour.

Muscles *contract*, that is, their fibres become shorter ; they *relax*, that is, the fibres return to their original length ; uterine muscles also *retract*, that is, having become shorter when they relax, they do not return to their former length. This retraction is of the greatest importance in labour ; it does not commence till labour starts, and is confined to the upper segment of the body of the uterus. It thus results that as labour progresses the upper segment gets thicker and the lower segment gets thinner.

First Stage.—The outer, or longitudinal muscles, pull up the cervix, so dilating it, and the inner group of muscles raise the pressure inside the uterus and assists with retraction in dilating the lower uterine segment.

Second Stage.—The contracting muscles are the principal factors in expressing the child, and during their relaxation those which are retracted reduce the size of the uterine cavity.

Third Stage.—Retraction gradually separates the placenta from the placental site, while the middle group of muscles prevent postpartum haemorrhage by contracting round the coiled branches of the uterine arteries. The contraction expels the placenta and membranes.

Placenta.—Relaxation of the uterus not only allows the mother to obtain temporary rest, but also the placental circulation to continue, which is impeded when the uterus contracts.

The Child.—The position is one of flexion, the vertebral column being flexed, the head bent on the chest, the thighs bent on the abdomen, the legs on the thighs, and the arms across the chest. Descent of the child does not occur during the 1st stage.

Second Stage of Labour.

From the full dilatation of the external os to the expulsion of the child.

Uterus.—Retraction of the upper uterine segment now becomes marked and more forcible. The result being diminution in the size of the uterine cavity which prevents the child slipping back ; the room available for the child becomes

less and less, and it is squeezed gradually into the vagina and out into the world. The contracting muscles act in two ways, one by *direct pressure* on the child, and the other by the *general intra-uterine pressure* which, acting through the remaining liquor amnii, keeps the child in the best position for its passage down the genital canal.

Placenta and Membranes.—So long as there is sufficient liquor amnii retained in the uterus above the head of the child, the circulation through the placenta is not injuriously interfered with. In the absence of relaxation, due to a dangerous condition termed tonic contraction of the uterus, the child is in great danger of being asphyxiated.

The Auxiliary Muscles.—Associated with the contractions of the uterus certain skeletal muscles commence to contract with each uterine contraction. Thus the woman fixes her pelvis by pressing her feet against the bottom of the bed, her shoulders by pulling on a towel tied to the end of the bed, and her diaphragm by holding her breath. In the latter case the woman, having taken a deep inspiration, holds her breath, with the result that the diaphragm is depressed, presses on the uterus, and the latter has a firm structure to press against which increases its power. Also by contracting her abdominal muscles (bearing down) the inter-abdominal pressure is considerably raised which, acting on the uterus, is an additional factor of some magnitude.

The Child.—During its passage through the genital canal, the head and body of the child undergo certain movements which allow these parts to enter the largest diameters of the genital passage. Since the lowest part of the head of the child will not be subjected to so much pressure, serum escapes from the capillaries of the scalp between the skin and pericraneum of the skull. A swelling is thus formed termed the *caput succedaneum.*

The Third Stage of Labour.

From the expulsion of the child to that of the placenta and membranes. After the birth of the child and its separation the woman should be placed on her back with her legs drawn up.

Uterus.—On the expulsion of the child the retraction of the uterus becomes more marked, so that on placing a hand on the abdomen over the uterus the latter feels hard and round, and has always been compared to the feel of a cricket ball. Then the uterus, to rest, relaxes somewhat, and obtains more nourishment (blood), and this contraction and relaxation continues at frequent intervals, but in the intervals of contraction there still remains retraction. The object of the contractions is to expel the placenta when it is separated and with the aid of retraction to prevent postpartum hæmorrhage.

The Placenta and Membranes.—Since the placenta is not elastic it cannot shrink. Retraction results in the shrinking of the placental site ; it is obvious, therefore, that the placenta must gradually become separated. The expulsion of the placenta and membranes can be effected by Nature if the patient is left alone, which may take an hour or more. The placenta having once separated and in the vagina, *but only then*, it is customary to hasten its expulsion, for the comfort of the mother, by squeezing the top of the uterus with the hand on the abdomen (thumb in front, fingers behind the uterus), and pushing the uterus downwards and forwards to expel it out of the vagina. If the placenta has separated but not left the uterus, the pressure must be applied first downwards and backwards to get it out of the uterus.

The Auxiliary Muscles.—After the birth of the child, when the pains gradually return, the woman will use her auxiliary muscles to assist the uterus in expressing the placenta and membranes.

The Child.—The eyes of the child, directly its head is born, should be gently swabbed with boric acid solution, a separate swab being used for each eye. After the birth of the child, and when the pulsation in the umbilical cord has ceased, the cord should be ligatured with sterilized thread, the ligature being applied 2 inches from its umbilicus, which should then be divided with sterilized scissors on the side nearest the vulva. Care should be taken to ensure that the piece of cord attached to the child is not bleeding, and wrapped in a sterile swab. After the child has been washed the stump of the cord is painted with tincture of iodine, if this is available, and wrapped in sterilized gauze, taking care

the iodine does not touch the skin. The end of the stump is then turned up, a pad of wool is placed over it and a binder applied.

After the child has been separated it should be wrapped in a sterilized blanket, and placed in a basket not too near a fire.

Signs that the Placenta has Separated.—To those who are not trained in midwifery the best signs are those which have relation to the umbilical cord. After the child has been separated the nurse should, therefore, having *gently* pulled on the cord to extract from the vagina any curled up portion, tie another ligature up against the vulva.

Pressure on the abdomen over the uterus will then force the vulval ligature away from the vulva, and if the placenta has separated it will not return to the vulva when this pressure is released. The same will obtain if the patient is told to bear down.

Antiseptic Precautions.—The State Registered Nurse will have been thoroughly trained in the importance and use of asepsis and antisepsis. When attending a woman in her confinement she will then be in a position to apply, and conscientiously, such knowledge. If she has them she should use a mask and indiarubber gloves. One of the best antiseptics to use is dettol, 1 ounce to 19 ounces of boiled water.

Attention to the Mother.—If there is time the vulva should be shaved, otherwise the vulval hairs should be clipped short. The patient should be dressed in a clean nightgown which is fixed up under the armpits to keep it from being soiled, and the lower part of the body should be covered by a clean washable petticoat, in the absence of a sterilized labour skirt. She should be encouraged to pass water frequently.

During the 1st stage the patient will be resting on the bed, in a chair or walking about.

During the 2nd stage she should be placed in the left lateral position with her hips right at the side of the bed, lying on a clean sheet under which, if it is available, should be placed a piece of mackintosh sheeting. The vulva should be swabbed from time to time.

After the separation of the child and expulsion of the placenta the vulval region should be carefully swabbed and a pad

and abdominal binder applied. The patient should not be left while the pulse-rate is above 100. During the 1st stage the patient should be encouraged to take light refreshment, and during the 2nd stage, milk or tea.

Examination of Placenta and Membranes.—The nurse must save these for the inspection of the doctor when he arrives.

CHAPTER VII.

HÆMORRHAGE.

HÆMORRHAGE in gynæcological cases is a subject included in the Syllabus of the General Nursing Council, as one of the subjects of its examination. I take it this refers to hæmorrhage of such a nature that every endeavour must be made to arrest it before the doctor arrives.

Such a definition will include hæmorrhage due to abortion, cancer of the uterus, vagina and vulva, fibroid tumours, injuries to the vagina or vulva, chronic metritis and post-operative.

Although antepartum and postpartum hæmorrhage are not mentioned as such, as subjects for examination, nevertheless they are included in this book, since it may happen on rare occasions, a doctor or midwife not being available forthwith, a registered nurse, though not trained in midwifery, will be called to a patient in such circumstances, and has to do the best she can. The treatment of the causes of hæmorrhage mentioned in this book will be found in their respective sections, but it is useful to summarize it.

Symptoms of Hæmorrhage, whether External or Intraperitoneal.

> Nausea.
> Feeling of faintness.
> Noises in the ears.
> Flashes of light before the eyes.
> Air-hunger.
> Feeling of sinking through the bed.
> Thirst due to the loss of fluid.

Signs of Hæmorrhage, whether External or Intra-peritoneal.

Marked pallor of the skin, lips, and mucous membranes of the eyes.

Skin bathed in cold perspiration.

Cold extremities.

Subnormal temperature.

A falling blood-pressure.

Small feeble pulse, the rate of which rapidly increases, if the bleeding is not arrested, and at the end is uncountable.

Respiration hurried and of a deep sighing character, because the patient requires more oxygen ; later marked struggling for breath.

Great restlessness, the arms being thrown about and, otherwise, the patient constantly moving.

Mental confusion.

Convulsions.

Unconsciousness.

And in the case of external bleeding the escape of blood from the wound or from the vagina or vulva.

Methods of the Arresting of Hæmorrhage from the Genital Canal.

Drugs.—The drugs used for controlling hæmorrhage in a pregnant woman are one or other of the preparations of ergot and/or an extract of the posterior lobe of the pituitary gland termed pitocin. The best preparation of ergot, one that is stabile and can be given by the mouth or hypodermically, is ergometrine. Pituitary extract, which is not infrequently given, is not so useful as pitocin, since its other extract, pitressin, raises the blood-pressure, which effect may be quite contra-indicated.

Ergometrine and pitocin make involuntary muscle contract and, since the uterus is composed of this variety of muscle, these drugs make the uterus contract and retract during which the coiled branches of the uterine arteries are compressed and so prevent the blood escaping. Pitocin, however, acts on the uterus only in labour, or when the uterus is abnormally contracting, as in cases of abortion. It is useless, therefore, to prescribe it when the woman is not pregnant, or when pregnant unless she is in labour or is aborting.

Ergometrine is of use in some cases of hæmorrhage due to fibroid tumours, and occasionally in cancer of the body of the uterus when the bleeding is not excessive. It is of no use in cancer of the neck of the uterus, and its use in chronic metritis is disappointing.

Hot Douches.—These incite the muscles of the uterus and blood-vessels to contract, so that they are usefully employed in cases of abortion, antepartum and postpartum hæmorrhage and cancer of the neck of the uterus. Such douches are at times given in cases of excessive bleeding due to fibroid tumours and chronic metritis, but whether they will be effective in any particular patient can be ascertained only by their use. The water should contain some antiseptic and be a temperature of 115° F. to 118° F. when injected.

Pressure.—The only condition which occurs to the author in which some form of pressure by forceps might be applied in obstetrical practice is that of severe laceration of the cervix during labour, involving a large branch of the uterine artery. Even for a trained midwife this method of arresting such a hæmorrhage, which necessitates the introduction of a vaginal speculum and extra assistance before clamping the two parts of the lacerated cervix together, is so difficult that the other methods which she has been taught for dealing with hæmorrhage before resorting to this method must suffice.

Pressure on the uterus with the hand, or hands, is effectively used in most cases of postpartum hæmorrhage. Varicose veins of the vulva may rupture during pregnancy or labour, or they may be lacerated by a kick or the breaking of a chamber-pot. The hæmorrhage may be very severe, but can be at once arrested by applying a thick pad of lint to the site of injury and pressing on this with the fingers.

Plugging the Vagina.—This is of distinct use in cases of abortion, some cases of antepartum hæmorrhage and cancer of the neck of the uterus. In the latter the plug presses against the orifices of the bleeding vessels, and in the others it makes the uterus contract.

Radium and X-Rays.—These methods are used for arresting bleeding in some cases of fibroid tumours, chronic subinvolution and cancer of the neck of the uterus, in the latter case when the growth is inoperable.

The disadvantages of the use of X-rays for fibroid tumours are as follows : This treatment is not likely to be successful in patients under 40 years of age. Since above this age cancer of the body of the uterus is more common, a preliminary curetting must first be performed In the past there have been

many cases in which it has not been, and in a certain percentage of fibroid tumours of the body cancer is also present, and so by the use of the X-rays alone the chance of a cure may be lost. Preliminary curetting should also be performed in cases of chronic metritis for the same reason. Again, X-rays sometimes causes the fibroid to degenerate, which is a serious complication, and may lead to death. Moreover, a diseased Fallopian tube or an ovarian tumour may be mistaken clinically for a fibroid. In cases of chronic subinvolution the usual methods of drug treatment being so disappointing, formerly hysterectomy was performed. The method of treating chronic subinvolution by radium very rarely fails to arrest the hæmorrhage, and in the 4 per cent. or so of cases in which an absolute cure is not obtained, the bleeding will stop for many months up to a year in some patients, or the periods may become normal. Radium has the advantage that the treatment can be carried out at one sitting, whereas that by X-rays requires several.

Radium and X-rays acting on the ovaries, will in most cases induce the menopause. The patient must, therefore, be warned that this may be the result, and if so, that she will probably be sterilized.

Surgical.—The surgical methods of treating hæmorrhage in gynæcological cases will be found under their respective headings : **Blood Transfusion, Injection of Banked Blood, Plasma, Serum, Glucose, Saline.**—See pages 377 to 393.

Antepartum Hæmorrhage.

The true definition of this term is bleeding before the birth of the child. In most text-books on midwifery the term antepartum hæmorrhage is reserved for cases of accidental and unavoidable hæmorrhage.

Abortion.

The placenta can first be demonstrated about the 10th week of pregnancy, but until the 28th week there is no postage-stamp layer. Thus, if abortion occurs during these 18 weeks, the uterus has difficulty in expelling the placenta and so part, or whole, of it may be retained, which may lead

to serious hæmorrhage or sepsis. It is for this reason that 'knowing' abortionists apply their illegal trade before the end of the 3rd month.

Abortion appears to be on the increase in all countries. The Report of Inter-Departmental Committee on Maternal Mortality, 1939, records the general impression of its members that " the number of abortions in England and Wales is between 110,000 and 150,000 a year, of which probably 40 per cent. are criminal, and conclude that artificially induced abortions involve greater risk, especially when self-procured or procured by unqualified persons." It has probably increased.

Cause.—If the fœtus dies, the woman must abort. The fœtus will die if it is deprived in the first 3 months of pregnancy of an adequate blood supply by the separation of too many chorionic villi, or later by the separation of too large a piece of placenta. Thus blows, or other injuries ; certain diseases of the placenta or membranes ; certain maternal diseases or abnormal contractions of the uterus due to fright, or an incarcerated backward displacement of the uterus (in the latter case since this organ being unable to rise into the abdomen there is no room for it to expand), are causes. The fœtus may be killed if the mother is poisoned, for example by lead.

There is no known drug which will certainly cause an abortion, otherwise, if it were safe, doctors would use it when necessary, in preference to surgical interference. In a few cases a surgical operation will be followed by abortion, and some women, in the absence of any apparent cause, abort repeatedly, which unfortunate complication is termed the *habit of aborting*.

Abortion accounts for far more illness, some of it life-long or demanding dangerous surgical operations, than is generally recognized, especially in those cases due to criminal abortion, following which there are many deaths each year.

Varieties.—Abortion is termed *threatened* or *inevitable*. Threatened if the fœtus has not already been killed by some disease, or if only a small portion of the villi or placenta has been separated ; inevitable if a large portion of the villi or placenta has been separated, when the bleeding is excessive, or when the contractions of the uterus are abnormally strong, as indicated by severe abdominal pain. If the whole ovum

is expelled, the inevitable abortion is termed *complete*, if a portion is retained it is termed *incomplete*.

Results.—Abortion, in some women, is apparently such a harmless complication that either they are unaware of its occurrence or, realizing their condition, ignore it and continue their usual vocation. Nevertheless, occasionally the amount of blood lost places their lives in jeopardy. The commonest danger, however, is that of sepsis, which is a frequent cause of sterility, and is one of the most frequent causes of disease of the Fallopian tubes and ovaries.

Treatment.—

Threatened Abortion.—This chiefly consists in keeping the patient as quiet as possible. Therefore, she must be kept in bed for at least a week after the last sign of bleeding has disappeared. Such disturbing influences as visitors, noise, letters, newspapers must be avoided. All highly seasoned articles of food and alcohol are forbidden, and the doctor will prescribe some preparation of opium. The bowels will be kept acting regularly by some mild aperient.

Inevitable Abortion.—In the absence of serious bleeding or sepsis (generally in incomplete abortion), inevitable abortion is correctly treated by allowing Nature to terminate the pregnancy. Otherwise, the doctor will empty the uterus.

Nursing.—In addition to carrying out the doctor's orders there are a few important points the nurse must remember :—

1. She must not give the patient any food until the doctor has seen the patient, since he may decide to empty the uterus for which an anæsthetic will be required.
2. She must save a specimen of the urine and everything which is passed by the vagina. The latter because the doctor will require to know what has been expelled and so if any part of the ovum has been retained.
3. Since the doctor may decide to empty the uterus, the nurse must prepare the patient, and her surroundings, as she would for any other operation.
4. If the patient is bleeding dangerously, and the doctor has not arrived, the nurse should give an antiseptic douche at a temperature of 118° F., which should

make the uterus contract so that it closes up the space between it and that part of the ovum or placenta which has separated, and thus plug the mouths of the bleeding vessels. In addition, if she has the one or the other, she should give a dose of ergometrine or pitocin.

If these measures are not sufficient to arrest the bleeding the nurse, if she is capable of so doing, should plug the vagina. See page 215.

Accidental Hæmorrhage.

This is due to the separation of part, very rarely the whole, of a normally situated placenta from the 28th week of pregnancy to the end of the 2nd stage of labour.

Causes.—These may be *inflammatory*, *toxæmic* or *traumatic*.

Varieties.—If the blood is not retained in the uterus, but escapes *per vaginam*, the variety is termed *revealed*. If the blood is held up in the uterus the variety is termed *concealed*. If most of the blood is held up in the uterus, but some of it escapes *per vaginam*, the variety is termed *combined*. The blood is held up in the uterus because the latter is not contracting. The concealed and combined varieties are the most dangerous.

Symptoms.—Those of hæmorrhage, and abdominal pain which is very severe in the concealed and combined varieties.

Signs.—Those of hæmorrhage, and in the concealed and combined varieties of internal hæmorrhage. In the concealed and combined varieties the uterus is hard, board-like, and tender.

Treatment.—In mild cases the patient will be treated on the lines of a threatened abortion. If the bleeding is severe, the doctor will apply a tight binder, rupture the membranes, give a dose of ergometrine or pitocin and, perhaps, plug the vagina.

In the concealed and combined varieties, if possible, after the shock, which is very pronounced in some cases, has been treated, the doctor will deliver the child, the method depending on the amount of dilatation of the cervix, so that Cæsarean section or Cæsarean hysterectomy may be necessary, the results of which are extremely bad.

Duties of the Nurse.—If the bleeding is very severe, the nurse should give a hot vaginal douche, apply a tight binder, and rupture the membranes if she has been taught how to do so, and give a dose of ergometrine if she has it. Otherwise she should wait for the attendance of the doctor.

The douche apparatus with plenty of hot water should be available in case there is postpartum hæmorrhage, since, owing to the amount of blood the patient may have already lost, a small quantity post-partum may be fatal.

Unavoidable Hæmorrhage.

This is due to the partial separation, or very rarely the total separation, of an abnormally situated placenta from the 28th week to the end of the 2nd stage of labour.

In this case the placenta is situated on the lower uterine segment, or partly so, and is termed a *placenta prævia*. Why it is so situated is unknown for certain. The bleeding is unavoidable, since when the lower uterine segment and the internal os commenced to dilate the placenta cannot follow the dilatation, and so becomes detached from the placental site.

Varieties.—There are three varieties according to whether the internal os is completely or partially covered or not at all.

Symptoms.—Those of hæmorrhage. The patient may give a history that the bleeding came on when she was asleep or quietly sitting in a chair.

Signs.—Those of hæmorrhage. A certain diagnosis can only be determined by feeling the placenta on vaginal examination, which comes within the province of the doctor, so far as the nurse is concerned.

Treatment.—This will depend entirely on how far the cervix has dilated, and need not concern us here, except to state that in cases of complete placenta prævia Cæsarean section is generally performed because such cases are so dangerous owing to the difficulty of delivering the child past, or through, the placenta.

Duties of the Nurse.—The main principles of treatment are those detailed under accidental hæmorrhage.

Postpartum Hæmorrhage.

Although, nowadays, a woman in labour will nearly always be able to obtain the services of a midwife, nevertheless it may be, and has indeed happened, that a State Registered Nurse will be summoned to attend the emergency of postpartum
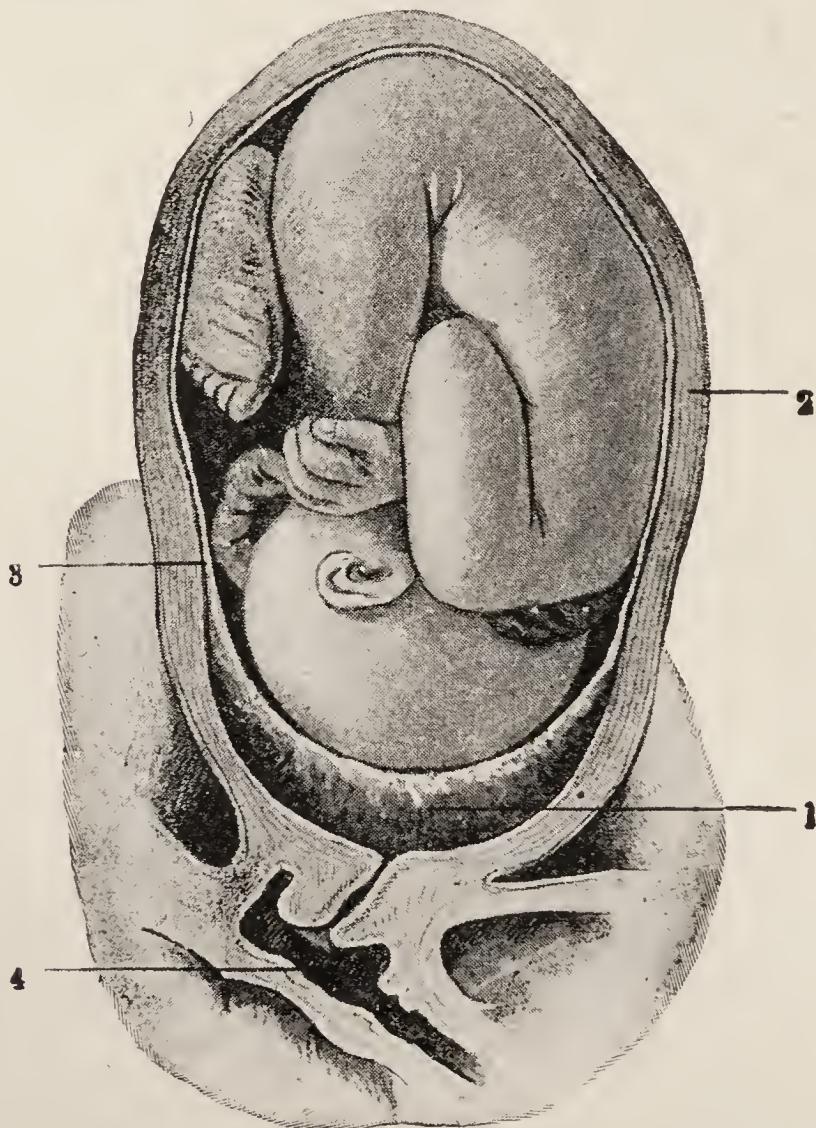

FIG. 12.—Uterus cut in half showing the position of the placenta in the lower uterine segment, in placenta prævia. 1. Central placenta prævia ; 2. Wall of uterus ; 3. Membranes ; 4. Vagina.

hæmorrhage, other assistance at the time being unobtainable. To treat such a complication, it is most important that a nurse should realize why, after the termination of the 2nd stage of labour, postpartum hæmorrhage does not occur in the vast majority of cases, but that if it does then the reasons why the woman is bleeding excessively should be ascertained. The

mechanism by which Nature prevents postpartum hæmorrhage during the 3rd stage of labour is described on page 12.

As will be seen, in most cases the patient is bleeding because the uterine muscle is not *retracting* properly. It is true that during the 3rd stage of labour the patient will not bleed when the uterus is *contracting*, nevertheless, from time to time the uterus must relax to obtain blood for its nourishment, and if, during these intervals retraction is absent, postpartum hæmorrhage will occur as, indeed, it will if the uterus is not contracting at all.

Causes.—These may be summarized as follows :—

1. Deficient retraction of that portion of the placental site from which the placenta had separated. As a result the blood escapes from the uterine sinuses in the placental site.

2. Absence of contraction of the uterus. In other words, the uterine muscle is exhausted and, for the time being, is in a paralytic condition.

Apart from the causes due to inefficient uterine action there are traumatic causes such as :—

3. A severe laceration of the cervix, involving one of the larger branches of the uterine artery.

4. Inversion of the uterus (turning inside out).

Signs.—Since the great majority of cases of postpartum hæmorrhage are due to inefficient uterine action, a nurse who is summoned to treat such a case should be able to satisfy herself of the cause. If, with her hand on the abdomen of the patient, she notices that the uterus is *hard*, so that it is easily felt, or if at intervals it becomes hard and then soft, then hard again, and so on, as it does normally, she may assume that the bleeding is not due to inefficient uterine action but to a traumatic cause. Moreover, furious postpartum hæmorrhage will certainly be due to inefficient uterine action. If the blood is held up in the uterus, due to inefficient uterine action, it will escape in gushes when the nurse applies pressure to the uterus.

The very rare complication of *inversion* of the uterus is not so much accompanied by a serious loss of blood as with shock to the patient, although there is some bleeding. In this case

the nurse would not be able to feel the outside of the uterus on abdominal examination but would be able to feel the inside of the uterus on vaginal examination.

Treatment.—If the nurse chanced to have in her bag some preparation of ergot or pitocin she should administer a dose as soon as she can. The nurse should treat the post-partum hæmorrhage on the assumption that it is due to inefficient uterine action, since this is the commonest cause. What she should then do will depend upon whether the bleeding is taking place after the placenta has been expelled or before.

Bleeding due to Deficient Retraction.

After the Placenta has been Expelled.—The uterus should be firmly squeezed through the abdominal wall with the left hand, the patient lying on her back. When the uterus becomes hard the nurse should still keep her hand on it, squeezing it when it softens. In addition, a hot antiseptic douche should be given. If the bleeding is due to deficient retraction such measures will arrest it.

Before the Placenta has been Expelled.—In this case the placenta may have separated from the placental site or, perhaps, more likely only a part of it has separated. The nurse should vigorously squeeze the uterus with her hand, as depicted in Fig. 13. If the uterus does not respond, and the bleeding still continues, the nurse should endeavour to express the placenta by squeezing the uterus (to separate any portion of the placenta not separated) and at the same time push the uterus downwards and backwards to expel it from the uterus, and then downwards and forwards to expel the placenta from the vulva. The placenta being expelled, a douche of hot water, 120° F., and dettol, $\frac{1}{2}$ an ounce to a pint of boiled water, should be given. The douche nozzle having been inserted into the vagina for a few moments, so that the solution washes out the vagina, the nozzle is then passed up into the cavity of the uterus and an intra-uterine douche of one or more pints should be given.

It is only very rarely that such treatment is not successful. Occasionally, however, the bleeding being due to partial

separation of the placenta, the efforts already described to separate the remaining portion of the placenta and then expel it will not be successful. The position is then more serious, since the bleeding will not cease until the placenta is expelled.

In such circumstances a doctor would, with his left hand squeezing on and pushing down the uterus, pass his right hand into the vagina and then fold it into a fist. Following up the umbilical cord into the uterus he feels the edge of

FIG. 13.—Body of woman cut in half to show the correct position of the left hand of the nurse when expressing the placenta. Note that the thumb is in front of the uterus and the fingers behind.

the placenta, and peels the remainder of the placenta off the placental site and removes the placenta and membranes in his hand.

This manual removal of the placenta is a very dangerous operation, in that following it the patient may be very shocked, and also the chances of infection of the uterus are greatly increased. Indeed, many deaths every year are associated with this procedure, and a doctor who knows his midwifery

will hesitate to resort to it until he is satisfied that this is the only thing to do.

The position of a nurse in such a case is similar to that of the doctor, except that in addition she is attempting to carry out a method of treatment which she has never before attempted. All that one can say here is that the nurse, knowing what should be done, must, to the best of her ability, endeavour to do it. Whatever happens, she will be praised for doing her best, and certainly will not be blamed if she is not successful.

Bleeding due to Absence of Contractions. Placenta being Expelled.

If the measures detailed above fail to arrest the bleeding, the latter is due to the fact that for the time being the uterine muscle is paralysed. This very dangerous complication is rare. The only thing left for the nurse to do is to compress the uterus bimanually, as indicated in Fig. 14. With the woman on her back and her legs drawn up, the nurse, with her left hand, presses the uterus forwards and passes her right hand into the vagina, afterwards flexing the fingers so as to make a fist which she places in front of the uterus. Pressure with one hand on the abdomen and the fist in the vagina then brings the inner wall of the cavity of the uterus into close apposition, and if this method is properly applied the bleeding must be arrested, since there is no cavity into which the blood can escape. A hot antiseptic douche should be given after the bleeding has stopped.

Laceration of the Cervix.—If the uterus is contracting well and regularly the bleeding will be due to laceration of the cervix. In this case a hot antiseptic douche should be given, and if this fails to stop the bleeding, and medical assistance does not arrive, the nurse should pack the vagina.

Inversion of the Uterus.—In this case the nurse can usually afford to await the arrival of the doctor, and meanwhile should treat the patient for shock. The doctor will apply pressure *per abdomen* over the original site of the uterus with his right hand, and with his left push the inverted body of the uterus back into its original position, afterwards giving an intra-uterine antiseptic hot douche.

Shock.—Patients who have had a bad hæmorrhage will also be suffering from shock. The treatment of this condition will be found on page 337.

The treatment of postpartum hæmorrhage as here set out is that taught to pupil-midwives. Medical students are not registered as fully qualified until they have passed an exam-
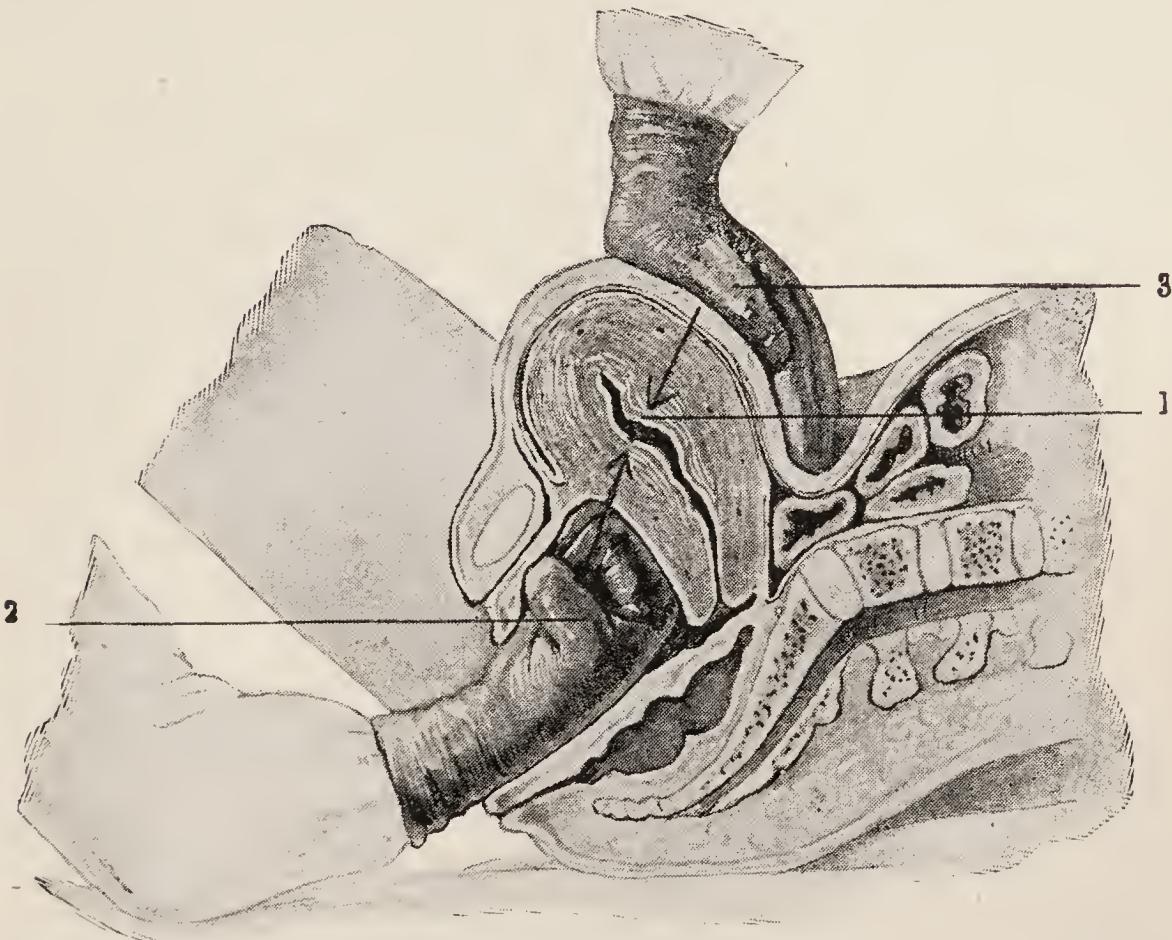

Fig. 14.—Bimanual compression. Body of the woman cut in half to show the right fist of the nurse in the vagina pressing up the anterior wall of the uterus, and the left hand of the nurse over the abdomen pressing forwards the posterior wall of the uterus. 1. Placental site ; 2. Right fist ; 3. Left hand.

ination in midwifery. A State Registered Nurse is not properly qualified until she has obtained the Certificate of the Central Midwives Board, Parts 1 and 2. Unfortunately, while a qualification in midwifery is imperative in the case of medical students, in the case of State Registered Nurses this is not so.

Postnatal Care.

If a nurse has the opportunity she should advise a woman after her confinement, if she has not already done so, to consult a postnatal centre, or her doctor, a few weeks after her confinement. This subject is not dealt with here on the assumption that a nurse, who is not a qualified midwife, has been called to attend a woman in her confinement only for an emergency.

Extra-Uterine Gestation.

There are two situations in which the oöcyte can be fertilized. The one in the Fallopian tube, which is the normal situation, the other in a Graafian follicle, after this has burst, but before the oöcyte has been discharged. The latter very rare complication is termed ovarian pregnancy; the former, tubal pregnancy, when the zygote remains in the tube.

Tubal Gestation.

This is comparatively common.

Cause.—Why the zygote remains in the tube and there continues to develop is unknown. This subject is dealt with rather more fully than in the case of the other hæmorrhages of pregnancy, since it is a complication most nurses may have not infrequently met with in their practice.

Morbid Anatomy.—It has been stated that when the zygote arrives at the uterine cavity it embeds itself in the decidua, and in the course of time the chorionic villi open up capillaries and the blood, escaping into the spongy layer of the decidua, forms blood-lakes into which the villi dip for purposes of nutrition of the fœtus and to get rid of the waste products of the fœtus. If the zygote remains in the tube and there develops it embeds itself in the mucous membrane of the tube as in normal pregnancy it would have done in the decidua. This mucous membrane is far thinner than the decidua and so the zygote soon reaches the muscle of the tube, opens capillaries and blood escapes between the muscle fibres. The tube, being unable to withstand the pressure of the effused blood, ruptures, and the blood escapes, carrying with it the zygote, with one of the following results :—

1. The blood may burst into the lumen of the tube and then escapes, together with the zygote, through the abdominal ostium of the tube into the peritoneal cavity. The zygote perishes. This is termed *tubal abortion*.

2. The blood may burst out of the tube into the peritoneal cavity or into the broad ligament. The zygote perishes. This is termed *tubal rupture*.

3. Very rarely the capillaries in the muscle escape injury, and instead of the escape of an appreciable amount of blood, as in 1 and 2, there is only a little oozing and the zygote passes through the muscle wall of the tube into the peritoneal cavity most commonly or into the broad ligament. This is termed *tubal erosion*, and the zygote, not being entirely separated from its attachments in the tube and acquiring adhesions and a blood supply from neighbouring structures, continues to live, for a time at anyrate.

It is interesting to note what may happen subsequent to a tubal erosion :—

(a) The fœtus may be converted into a mummy, into soap (adipocere), or become impregnated with lime salts (lithopædion). The dead fœtus may remain in such a state for years, and the woman live to old age and die of some intercurrent disease.

(b) As a rule the mummy, adipocere or lithopædion becomes infected from the maternal intestine. Suppuration results, and unless surgically dealt with, the abscess may rupture into the bowel, bladder, or vagina, with the extrusion of pus and bones.

In the absence of (a) and (b) :

(c) The sac surrounding the fœtus, in which there are large blood-vessels, may rupture, and furious hæmorrhage and death of the patient result, unless she is saved by a surgical operation.

(*d*) Very rarely the development of the fœtus may continue to term, when a false labour takes place, and the patient dies from internal hæmorrhage, or in due course labour ceases and the patient is left with a dead fœtus in her abdomen, which may become infected or remain undiscovered when the woman is operated upon for an abdominal tumour. It is only on extremely rare occasions that such a pregnancy will go to term.

Symptoms and Signs.—Up to a point, it is not difficult for a State Registered Nurse to suspect a tubal abortion or tubal rupture. The outstanding symptom and sign is internal hæmorrhage, and if the nurse is able to diagnose such a complication, and has learnt that among all the causes of internal hæmorrhage in a woman, tubal abortion or tubal rupture is the commonest, she should have a fairly good idea of what the patient is likely to be suffering from, and it would not surprise a doctor if she summoned him for a suspected case of tubal gestation. Indeed, as an example of how typical such cases are, the following is of interest. The husband of a woman was reading in the St. Pancras Public Library a text-book by the late Sir John Bland-Sutton, and became very interested in his description of tubal rupture. One day his wife became very ill, and the symptoms and signs that presented themselves to the husband tallied so closely with what he had read that he had his wife conveyed to the Middlesex Hospital, and told the admitting officer that his wife had a ruptured tubal gestation. The husband was of the artisan class, the admitting officer was a recently qualified doctor, and it is easy to imagine the conversation that took place, the admitting officer incredulous and the husband insistent. The patient was admitted, an operation performed, and her life saved.

Before Tubal Rupture or Abortion.—Beyond the fact that the woman may have missed one or two periods, and may complain of abdominal pain, a diagnosis is not likely to be made unless she consults a doctor for the pain, and on examination he discovers a swelling in one or other of the Fallopian tubes.

At Tubal Rupture or Abortion.—The woman is suddenly seized with very severe, perhaps agonizing, pain, and has the signs of internal hæmorrhage. The patient will probably have missed one or two periods, since the rupture or abortion generally occurs within the first 10 weeks of pregnancy. So great may be the loss of blood that the patient may fall back dead, or die in a few minutes. This is rare.

Since at the time of the rupture or abortion there is generally a dark brown, bloody discharge from the vagina, this might be mistaken for a threatened miscarriage, but the general condition of the patient should eliminate such a diagnosis. However, since in a few cases the diagnosis may be difficult, especially if the amount of blood lost is not great, the nurse must be most careful to save everything which is passed through the vagina, because the doctor will wish to examine it so as to ascertain whether part of the ovum has escaped, since in a tubal rupture or abortion there will be no such evidence, the ovum being in the tube or expelled from it. The vaginal bleeding is due to the separation, or part of it, of the decidua in the uterus.

After Erosion—The nurse will not be concerned with these symptoms and signs, apart from the fact that great internal hæmorrhage may occur. The patient generally consults a doctor for vague abdominal pains, thinking she is otherwise normally pregnant except that she may state that the child seems to be " all on one side."

Treatment.—Tubal gestation is a dangerous complication, though, if the patient is seen in time, the results of an immediate operation are nearly always successful.

An operation for extra-uterine gestation at or approaching term is a very dangerous operation. Fortunately, this condition is extremely rare.

In the rare condition of ovarian gestation, the symptoms and signs are practically similar to tubal gestation, and the operative treatment is similar.

3

DISEASES OF WOMEN.

PART 4.

CHAPTER VIII.

AMENORRHŒA.

Absence of Menstruation.—Regular menstruation depends on active ovaries, endometrium, the ripening of the Graafian follicles, the discharge of the oöcyte, and the formation of corpora lutea. It should occur once a month between puberty and the menopause unless the woman is pregnant or suckling her child. On occasions menstruation does not ensue until the girl is 17 years of age or over. Rarely the menstrual flow does not appear because there is some obstruction to its escape. It is important for nurses to remember that amenorrhœa in itself is not necessarily harmful to the individual, in fact it may be Nature's method of protecting the girl, as, for instance, in cases of anæmia, when obviously the less blood that she loses the better.

Late Puberty.

Menstruation, as a rule, starts about the age of 14. Nevertheless in some cases it is delayed till the girl is 17 or even older, and yet in such circumstances the individual appears to be in perfect health. Moreover, in many girls, although the first period came on at the usual time the succeeding periods appear only after an interval of a year or so. This is due to a delay in the activity of the sex hormones and, because of this, menstruation may otherwise be irregular both in the amount and periodicity for the first year after its commencement. This condition is medically treated by œstrogenic hormones.

Hidden Menstruation.

CAUSES.—

Congenital.—This is a rare condition in which the patency of the vaginal canal is obstructed at some spot, generally in the neighbourhood of the hymen, by a membrane stretching across it ; more rarely the hymen has no orifice piercing it, rarer still some portion, or even the whole, of the vagina may be absent, and, lastly, the cervical canal may be absent.

All the causes of hidden menstruation must be local, the menstrual discharge being unable to escape owing to some obstruction below the level of the internal os.

SYMPTOMS.—

Taking the commonest cause of this condition, a septum across the lower end of the vagina, the history one obtains is very instructive.

The girl complains, once a month, of abdominal pain, backache, and the other general symptoms of menstruation.

SIGNS.—

In due course, if the mother is careless and delays seeking medical advice, the girl's abdomen will gradually, month by month, become more prominent. This alteration in appearance is due to the formation of a swelling caused by the accumulation of the menstrual fluid in stretching the vagina, and pushing up the uterus (Fig. 15). In such cases, if the nurse examined the vulva of the patient, she would notice, on separating the labia, that the hymen was bulged forwards by a purplish swelling. Some girls are so uncomplaining, and some mothers are so ignorant, that medical advice is not sought until the accumulation of menstrual fluid in the vagina flattens the urethra by pressure and retention of urine results, and this is the most frequent complication for which the mother seeks advice.

If the obstruction is at the cervical canal the vaginal signs and those of retention of urine will not appear. In this case the condition can be diagnosed only by a medical man, the menstrual discharge being retained in the uterus, and in many cases distending the Fallopian tubes.

Disease.—Inflammation of the lining of the cervical canal or vagina, leading to ulceration, may result in the opposing surfaces becoming adherent one to the other. As a result the respective canals, or part of them, are obliterated, the menstrual fluid being retained above the obstruction. Such inflammation may be due to one of the acute specific fevers occurring in a child, the local condition remaining unnoticed
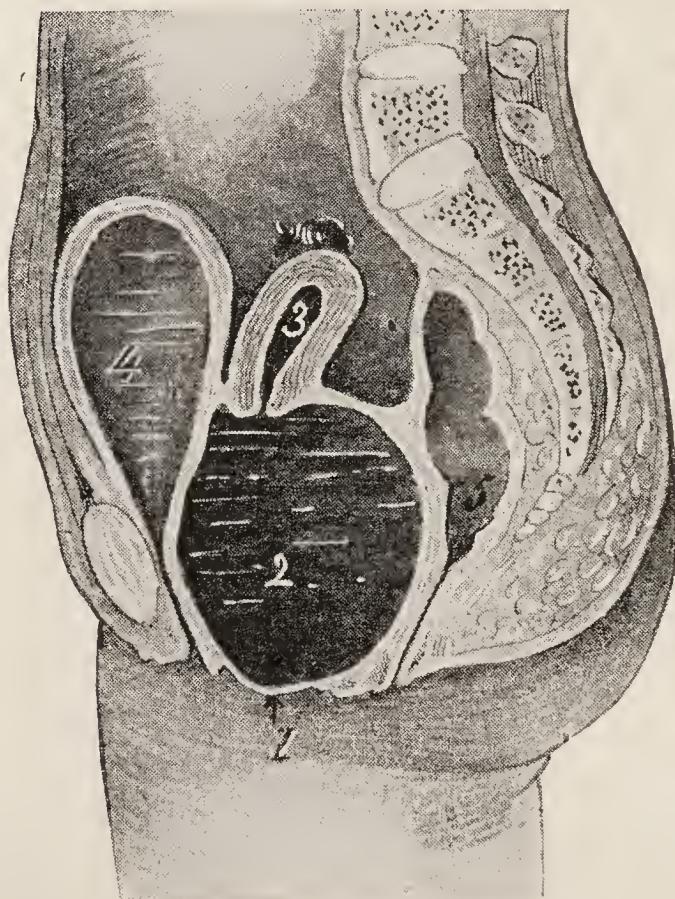
FIG. 15.—Body of woman cut in half to show the condition of hidden amenorrhœa due to the fact that the hymen, during its development, was not perforated. 1. Hymen depressed ; 2. Vagina distended ; 3. Uterus, cavity a little distended ; 4. Distended bladder ; 5. Rectum.

on account of the severity of the general symptoms. It may also follow sloughing due to injury of the vagina or cervix during labour, or to an operation on these parts.

SYMPTOMS AND SIGNS.—

The menstrual discharge once having been normal will have ceased, and some of the symptoms already described will be mentioned. A local examination by a medical man will disclose the cause.

TREATMENT.—This is surgical.

NURSING DUTIES.—The nurse who is in charge of a patient upon whom the operation of incising the septum, or hymen, has been performed, must be most careful that the retained menstrual fluid, as it is discharged, does not remain in contact with the vulva for any length of time, since it forms the best material in which certain common bacteria can grow, and there is great danger that these may infect the genital tract. The vulva, therefore, should be well swabbed with an anti-septic solution every time the diaper is changed, which should be frequently.

Excluding late puberty and hidden menstruation, amenor-rhœa may be classified into primary and secondary.

Primary Amenorrhœa.

This is a condition in which the woman has never menstruated although she should have done so.

CAUSES.—

Congenital.—Very rarely the uterus or ovaries, or both, may be absent. As a rule these organs have not developed as they should and are in an *infantile* condition. In such cases the breasts remain small, the vulva and mons veneris ill-developed and the pubic hair is very scanty.

Disease.—The ductless glands may be at fault, due to dis-ease, over-activity or deficient function of the pituitary or thyroid gland, the latter also being responsible for cretinism. Rarely tuberculosis or diabetes may be the cause. In those cases in which the woman approximates to the male type, with hair on the upper lip and a similar distribution over the pubes and abdomen, a tumour of the supra-renal cortex is found.

Treatment.—A thorough examination by a medical man will determine the treatment, if any. The same remarks apply to treatment when the ductless glands are at fault as were made under " late puberty."

Secondary Amenorrhœa.

In this case the woman has menstruated but, for one or other of the following causes it has ceased.

CAUSES.—

Physiological.—

Pregnancy.—A woman who is pregnant does not menstruate (see p. 48). The amenorrhœa of pregnancy is in most cases sudden; that is, up to the time of fertilization the woman usually has menstruated regularly or, to put it another way, supposing a woman has been quite regular, and menstruation does not appear when it is due, then be she single, married, or a widow, rich or poor, or whatever her religious denomination may be, the most likely cause of her amenorrhœa is pregnancy. Rarely women become pregnant when suffering from amenorrhœa due to some constitutional disease.

Lactation.—As a rule, a woman who has given birth to a child does not again menstruate till she has been suckling her child for some months. In some patients the periods do not appear till 2 or 3 months after the child is weaned. The mother, however, may not finish weaning her child, as she should, at 9 months because of the expense of buying milk, the trouble of preparing the food, or in the expectation that any further pregnancy can be prevented. In such cases the periods may become irregular or excessive. Some women menstruate regularly while nursing their children; and if the child thrives and keeps its weight, and the mother remains healthy, there is no necessity for her to give up suckling.

It is not at all uncommon for women to become pregnant in whom menstruation has not reappeared since the birth of their last child.

Menopause.—The change of life usually supervenes between the ages of 45 and 50. In some women, however, even in the absence of local disease, it is delayed as late as 52, while in others, it may supervene at 35 or even earlier. The menopause is not concerned only with the cessation of menstruation, since there are other symptoms and signs (see page 29) and, especially, the genital organs atrophy. The advent of the menopause may be postponed in women in whom puberty was early and hastened in those in whom puberty was late, in which case the periods are sometimes infrequent and of small amount. If the uterus is the seat of fibroids, or of chronic metritis, the advent of the menopause may be delayed.

Pathological.—

In young girls constipation is not an infrequent cause of secondary amenorrhœa as also when starting to earn a livelihood or on entering a profession such as nursing. It may follow any serious illness for the time being at anyrate; tubercle, secondary anæmia, insanity, diabetes, some cases of chronic cardiac disease and such drugs as opium and alcohol in victims of these vices may lead to complete suppression.

Other causes are the destruction of both ovaries by disease or abscess formation or the operative removal of these organs.

The fear of pregnancy, the desire for pregnancy, sudden fright or great grief may lead to temporary amenorrhœa.

TREATMENT.—

The correct method of treating amenorrhœa is for a doctor first to discover the cause, if possible, by a careful examination of the patient and then to treat it.

In the unlikely event of such a person being unable to obtain medical advice for some time, a nurse who recommended a preparation of iron and impressed upon the patient the absolute necessity of a daily action of the bowels would probably be rendering her a good service.

NURSING DUTIES.—

In hospital practice it is generally left to the Sister of the ward to explain to the patient that if, in the course of the proposed operation, the uterus or both ovaries have to be removed, the patient will be sterile, and will not again menstruate. The Sister will, in addition, ask the patient to sign a form giving the surgeon leave to do what he considers necessary, and the patient's signature should be witnessed by the Sister and nearest relative. It is most important that patients should be warned of such results, otherwise, in spite of the fact that they have signed such a form, they may afterwards contend that they did not understand the nature of the operation, so far as its results were concerned, and legal actions have been brought against the surgeon in such circumstances.

CHAPTER IX.

BLEEDING. MENORRHAGIA AND METRORRHAGIA.

(*See also Hæmorrhage, page* 48.)

THE traditional division of bleeding from the female genital tract into *menorrhagia* and *metrorrhagia* has but little to recommend it. Menorrhagia signifying an excessive loss of blood at the menstrual period, and metrorrhagia any loss between the periods, would be very suitable terms if all causes of abnormal bleeding could thus be pigeon-holed. Unfortunately, from the point of view of examinations, and more especially from that of practice, such a division will not stand criticism. The most that can be said is that an excessive loss of blood at menstruation may be due to some general cause or local cause, whereas bleeding between the periods must be due to some local cause.

There are many conditions which give rise both to excessive bleeding at the periods, and bleeding between the periods, and it is the knowledge of this which makes a division of the causes into menorrhagia and metrorrhagia unsatisfactory.

Whether the amount of blood lost at the menstrual period is really excessive, must in the first place be considered in relation to the usual (normal) loss of the individual. The amount lost can roughly be gauged by the number of diapers a woman uses during menstruation. This will surely vary in different women apart from the amount lost, but it may be taken that if a woman of cleanly habits uses more than 10 diapers, the loss is generally excessive. Certainly if a history is given of having to use 2 diapers at once, of having to use thick Turkish towelling, absorbent wool in addition to the diaper, or of the presence of clots, the loss is excessive. On occasions young girls or women, for purposes best known to

themselves (a girl I once saw in consultation wanted to get leave off school for a term), will declare that they are losing excessively at their periods, when their general appearance and condition makes one doubtful if such is the case. An inquiry, perhaps of the mother, as to the number of diapers used may elicit the reply that she does not know, because her daughter always burns them. The amount of blood lost—apart from the clots, if any, passed during micturition and defæcation—can be quite accurately determined by weighing the diapers before use and after use, the difference being the weight of blood lost.

The failure to remember, on the part of the doctor or nurse, that excessive loss at the periods may be due to some local disease, such as cancer, has prevented the cause being detected and so led to countless deaths.

CAUSES.—

Metropathia hæmorrhagica, which is an endocrinal disease, is due to the Graafian follicles not rupturing and so forming small cysts of the ovary, a thickened and polypoid condition of the endometrium being induced by prolonged or excessive secretion of œstrone in the absence of corpora lutea and so of the secretion of progesterone. The menstrual rhythm is disturbed so that there are periods of profuse flooding, or long continued hæmorrhage, alternating with periods of amenorrhœa. This condition was formerly attributed to chronic metritis or fibrosis uteri.

Pelvic Venous Congestion.—In the *newly married*, in women suffering from certain diseases of the *liver and kidney*, in women who intermittently indulge excessively in alcohol or harbour habitually a loaded rectum, pelvic congestion may be marked. Chronic alcoholism is a cause of amenorrhœa. Late hours, high living, and the modern sex novels and plays are perhaps more responsible as a cause of excessive menstruation than one realizes.

Menopause.—Excessive loss at this time should always be viewed with the greatest suspicion. It is quite true that many women lose more at their periods between the ages of 45 and 50 than at any other time of their menstrual life. *In many of these cases, however, this loss is due to*

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some local disease, a very common cause of which is cancer.
Nevertheless, owing to endocrinal disturbance, there are a
number of women who lose excessively between the ages of
45 and 50 in whom local disease cannot be discovered, and
after such losses menstruation ceases for good. It is not
difficult to realize, therefore, why an excessive loss, or losses,
at such a time should be attributed by the laity to the meno-
pause. The pity of it is, however, that some trained nurses,
and some doctors, labour under a similar misapprehension,
so that the nurse does not advise the woman to seek medical
advice, and the doctor does not examine the patient *per
vaginam*. This mistaken idea on the part of the laity, and
on that of some nurses and doctors, is responsible for the
deaths of many women every year. If those patients, in
whom an efficient local examination fails to disclose any disease,
are carefully questioned, it will be found that the excessive
hæmorrhages are separated by intervals during which blood
is not lost and, moreover, when the bleeding does come on
it is not necessarily when menstruation might have been ex-
pected ; thus there may be intervals of weeks or months
between the hæmorrhages. It is only in such circumstances
that a diagnosis of the menopause can be advanced with any
safety. In the absence of any marked intervals, the cause
will surely be that of local disease.

Prolonged Nursing.—Some women to save trouble, or the
cost of buying milk, may continue to nurse their children
well into the second year following their last labour, or do
so under the mistaken idea that pregnancy may thereby
be prevented. In such cases the periods may become ex-
cessive, which is not only bad for the health of the woman,
but also for that of the child, who will be deprived of the proper
quantities of the essential constituents of food necessary for
its health and growth owing to the quality of the milk having
deteriorated.

Change of Climate.—Excessive menstruation is a common
experience for women leaving a temperate for a hot climate.

The *local causes* of bleeding in women, which may in-
crease the loss at the periods and/or are responsible for a loss
between the periods, are many. The causes are better de-
tailed under the headings of the various genital organs :—

Ovaries.—Although ovarian tumours do not usually interfere with menstruation until the health of the patient is very deteriorated or both ovaries are destroyed when, as a rule, amenorrhœa results, there are certain tumours which are associated at times with excessive uterine hæmorrhage. These are malignant and dermoid tumours.

Fallopian Tubes.—*Malignant disease of the Fallopian tubes* is a very rare cause of inter-menstrual bleeding, the cherry-coloured discharge escaping into the uterus and then being discharged.

Uterus.—Innocent tumours such as *fibroids, endometrioma, mucous polypi, adenomyoma,* and malignant tumours such as *carcinoma, sarcoma,* and *chorion-carcinoma.* Inflammations of the endometrium such as *acute endometritis,* and of the muscle of the uterus as in *chronic metritis* (fibrosis).

Ulceration of the cervix due to carcinoma, sarcoma, syphilis, tubercle, to an ill-fitting or neglected pessary, or to some other foreign body, may be the cause of the bleeding, as also may chronic inversion and subinvolution.

Vulva.—*Carcinoma, sarcoma, injury,* ruptured *varicose veins,* and *syphilitic ulceration, cancer of the urethra,* and rarely an *urethral caruncle* may be the cause.

This is an exhaustive list and may not be of much value to the nurse as such. It is very important, however, that a nurse should have some idea of the most likely causes of abnormal bleeding, and since she has not had a medical training, and it is not her business to examine women, the diagnosis so far as a nurse is concerned can best be set out as in the section on " Discharges," under the most likely causes at various ages.

From Infancy to, and at Puberty.—In the first few weeks of life a female child may have a slight bleeding from the genital tract—the cause is not known. Somewhat later in early childhood there are two conditions which cause bleeding, are very serious and practically always fatal, sarcoma of the cervix and malignant ovarian tumours. The excessive loss at puberty which sometimes occurs is due to endocrinal dysfunction.

From Puberty to Marriage.—The commonest causes are those of venous congestion of the pelvic veins ; more rarely sarcoma of the uterus and malignant ovarian tumours.

From Marriage to the Menopause.—Again, in the early years subinvolution and infection of the endometrium, following labour or abortion, are the commonest causes, and then infection due to other causes and endocrinal dysfunction. As the patient gets older, fibroid tumours of the uterus, chronic metritis and cancer are the chief causes, and at the menopause the excessive losses with no detectable cause.

After the Menopause.—By far the most likely cause, at and after the menopause of a more or less continuous loss, is cancer in some portion of the genital organs. Other causes less common being mucous polypi, senile endometritis, degenerated fibroids and simple ovarian tumours.

There are two lessons to be learned from a perusal of the foregoing. The first is never to regard an excessive or irregular loss, at or about the menopause, as natural. This way disaster lies. *Every woman complaining of such a symptom must be examined internally so that cancer in its early stages will be discovered if it is present. If she refuses such an examination the doctor should decline to treat her. There can be no exception to such a statement, it is an aphorism.*

The second lesson is that bleeding between the periods, for all practical purposes, must be due to some local cause. This being granted, it follows that any woman with such a symptom should be carefully examined by a medical man, which examination should include a bimanual palpation, unless in single women it is obvious from an abdominal, vulval or rectal examination that there is a tumour which is the cause of her symptoms.

TREATMENT.—

The treatment of excessive, or abnormal, bleeding is the province of a doctor, and a short account of that usually followed will be found under the headings of the respective diseases described in this handbook.

With respect to *metropathia hæmorrhagica* a word of warning may be appropriate. In the past, at anyrate, this condition has been far too often diagnosed in comparatively young women, for want of a thorough investigation. The result has been that their uterus has been removed, or radium

applied thereto.   The injection of progesterone has met with some success in many cases.

Further, curettage for hæmorrhage, except in specially selected cases, is absolutely useless ; and yet day in and day out women are curetted only to find that in due course the bleeding has recurred, even with more than one curetting !

For excessive bleeding at the menopause, for which no cause can be detected, treatment by radium is very successful.

Nurse's Duties.—

The treatment by the nurse consists, for the most part, in giving the correct advice if her opinion is asked.   From what has already been said, it is obvious that an intelligent nurse, in such circumstances would, if she had ascertained that the periods were excessive or that there was bleeding between them, insist, so far as she could, on the woman or child having the advice of a doctor.   More than this, I think it is quite fair to say that if a woman over 40 years of age has been sent by a nurse to consult a doctor for excessive hæmorrhage and he has not examined the patient internally at the first or second interview, the patient should insist on his doing so, or the nurse should advise her to change her doctor.

For the rest, the nurse's assistance is likely to be sought only when there is serious bleeding going on, and the services of a doctor cannot be obtained within a reasonable time.

Irregular Menstruation in Young Adults.

It occasionally happens that young adults suffer from irregular menstruation, especially in these days with so many entering the factories and Services.   This irregularity takes two forms, either amenorrhœa or, more rarely, frequent menstruation.

Treatment.—

If the previous history is one of normal periods, apart from re-assurance, treatment is not necessary for 3 months or so, when regular menstruation generally returns.   If after such an interval the periods have not returned, the doctor will prescribe 5 mg. of Stilbœstrol daily for 2 weeks and then, when bleeding ceases, 1 mg. for 2 weeks once a month for 2 or 3 months.   If there is evidence of thyroid deficiency 1 grain daily is often successful.   For too frequent menstruation serum gonadotropin, 200 to 300 units weekly, will be prescribed, with iron-therapy when there is bleeding.

CHAPTER X.

PAIN.

The following varieties of pain will be discussed : dysmenorrhœa, intermenstrual pain, abdominal pain, backache, pelvic pain and dyspareunia.

Dysmenorrhœa.

Dysmenorrhœa signifies painful menstruation, but it is customary to apply this term also to pain in the genital region during the week before the flow appears.

The number of females *per* hundred who complain of pain during menstruation varies according to their age and to their behaviour during the menstrual period. A careful investigation by women doctors, into the subject of dysmenorrhœa among girls and young women in schools and colleges showed that in 78 per cent. menstruation was painless. In the remaining 22 per cent., slight discomfort was felt in 15 per cent., the pain was sub-acute in 4 per cent., and disabling in 3 per cent.

In the past the menstrual period was regarded by many mothers, school mistresses, and doctors as a time of semi-invalidism, rest in the recumbent position, the application of hot-water bottles to the abdomen and the use of drugs when there was the slightest discomfort, being advocated and prescribed.

Such treatment, in most cases, merely encouraged dysmenorrhœa to develop, and by the time the girls arrived at womanhood 70 per cent. complained of pain or discomfort.

The modern rules of hygiene of the menstrual period have markedly diminished the incidence of dysmenorrhœa.

It is a common observation that, as a rule, those women who complain the most of dysmenorrhœa have the least to think

about, and conversely the pain is more easily tolerated by those who have to earn their own living.

Dysmenorrhœa may be divided into three classes :—

1. That in which the pain is intermittent and colicky in nature.

2. That in which the pain is continuous and dull-aching in character.

3. That in which, with a dull-aching pain, there are intermittent periods of sharp intensity. This class is a combination of the first two.

Moreover, in each of these three classes there may, or may not, be some local disease to account for the pain.

Colicky Dysmenorrhœa.—*Local Disease Absent.*—In the majority of cases in nulliparous women an adequate cause cannot be found for the uterine colic, and the condition is then termed *spasmodic dysmenorrhœa.* The pain in these cases has been thought to be due to a neurosis, but it is often present in women in whom such a diagnosis could not be entertained. In some cases the shape of the uterus has not changed with puberty, and corresponds to that found in the infant, so that its body is markedly anteflexed, and its cervix has a pin-hole os and is conical in shape. It has been thought, therefore, that the pain may be due to this peculiarity, but such a shape is found very well marked in women with painless menstruation. It may be that some cases are due to a neurosis and others to a maldevelopment.

Local Disease Present.—The cause of the painful contractions of the uterus is due to some substance which it is endeavouring to expel, either blood-clot, mucous membrane, or a tumour.

When the flow is excessive, or when the cervical canal is narrowed, the blood does not escape so freely as it usually does and clots are, therefore, formed. The contractions of the uterus to expel these clots must necessarily be stronger than in normal menstruation when there are no clots. This increased effort of the uterus results in severe pain resembling colic, which lasts until the blood-clot is expelled. Any disease, therefore, in which excessive menstruation is a symptom, or in which the cervical canal is narrowed by atresia of the cervix or obstructed by a polypus, cancer, or fibroid, may give rise to colicky dysmenorrhœa.

A reference to the description of normal menstruation will remind the reader that superficial parts of the endometrium are desquamated with the escape of blood from its capillaries. In the disease known as *membranous dysmenorrhœa* there is an extravasation of blood into the deeper layers of the mucous membrane, so that large pieces of the superficial layer, or even the whole superficial layer (in which case there will be discharged a cast of the uterus), are stripped off. To expel these large pieces the uterus has to contract strongly, hence the pain.

Membranous dysmenorrhœa may have been present since the girl first menstruated, in which case the cause is unknown, or it may occur after several years as the result of septic infection of the endometrium following childbirth or otherwise.

Lastly the presence of a submucous fibroid or polypus in the uterus impels this organ to contract vigorously in its endeavour to expel it, and these contractions are especially marked during menstruation.

Congestive Dysmenorrhœa.—The genital organs become congested during the week preceding the period. This blood is accommodated by these organs becoming somewhat stretched or distended, and so long as they are not the seat of any disease this congestion causes but little discomfort in most women.

Local Disease Absent.—Congestive dysmenorrhœa, in the absence of local disease, does occur in young people. It is impossible satisfactorily to account for the cause of the pain. It is probably due to treating girls as semi-invalids while they are " unwell." The curtailing of exercise, the provision of hot-water bottles, and so forth, merely increasing the normal congestion at this time.

Local Disease Present.—When the internal genital organs of a woman are in a state of chronic congestion, or are inflamed, due to endometritis, salpingitis, pelvic peritonitis or pelvic cellulitis, or when tumours are present in the uterus, such as fibroids, endometrioma, and cancer, or in some cases when there is a backward displacement of this organ, the additional amount of blood causes increased pressure on the nerves of the uterus, and pain results. If, moreover, the uterus, ovaries, or Fallopian tubes are bound down by adhesions, and unable

to become distended or stretched with the congestion, the pain is worse. Another definite cause of dysmenorrhœa is endometrioma of the ovary (" chocolate cysts ").

Colicky and Congestive.—Many women who suffer from colicky dysmenorrhœa acquire, as time goes on, the congestive variety in addition. There is no need to discuss this third variety separately since its symptoms and signs are a combination of the first and second.

SYMPTOMS.—

The pain associated with colicky dysmenorrhœa is intermittent and continues till the blood-clots, or membrane, are expelled. The pain in a typical case of *spasmodic dysmenorrhœa* appears a few hours before the menstrual flow commences and lasts, as a rule, not longer than 24 hours. In many instances menstruation for the first 2 or 3 years is painless, or only causes slight discomfort, though at times the pain is present from the commencement. Spasmodic dysmenorrhœa is the commonest form of dysmenorrhœa in young women, and also the most painful, so that the patient may vomit, perspire, or even faint. The flow does not become fully established until the pain ceases. As time goes on, if the condition is not cured, there is a tendency for the supervention of the congestive type so that the pain becomes more continuous and may last much longer.

From what has been stated, as to the cause of congestive dysmenorrhœa, it might be supposed that the pain would appear sometimes before the menstrual flow, and decrease as the period continued. This, as a fact, is the case, the pain, which is of a dull-aching character, commencing perhaps 5 or 6 days before and disappearing, or being relieved, towards the end of the period.

TREATMENT.—

The proper method of treating dysmenorrhœa is to ascertain, if possible, the cause, which may necessitate a pelvic examination, and then to treat it. A nurse cannot from her training be expected to arrive at such a diagnosis.

Patients suffering from spasmodic dysmenorrhœa are successfully treated by attention to the general health, many of

the girls being anæmic and constipated and perhaps not taking sufficient exercise, and in such cases an internal examination is not necessary. The most usual drugs prescribed by the doctor are those of the coal-tar series, antipyrin, antikamnia, aspirin, ammonol, phenacetin or pyramidon.

If such measures fail, dilatation of the cervix will, in most cases, effect a cure, or at any rate greatly relieve the pain. The operation has this additional advantage, that if sterility, in addition, is complained of, such an operation will, in a certain percentage of cases, cure also the sterility.

NURSING.—

The nurse may be of the greatest assistance in giving advice on the preventive treatment of dysmenorrhœa.

The following copy of the leaflet, issued by the authority of the Council of the Medical Officers of Schools Associations, will give the nurse an idea on what lines her advice should be given. The carrying out of these Rules has reduced the incidence of dysmenorrhœa in girls at Schools and Colleges to a very marked extent :—

" *Advice to Girls Concerning their Monthly Period.*

" 1. The monthly period is not a malady but a natural function ; you ought, therefore, at these times to feel quite well and to be free from pain or any unpleasant sensations.

" 2. The ordinary rules of cleanliness and hygiene should be observed as at other times. There is no risk in the use of soap and water, in spite of the usual prejudice against it ; a warm bath should, if possible, be taken every day throughout the period ; if this is not possible, you should wash the whole body, including the feet, with soap and water. There should be a daily action of the bowels, as at other times.

" 3. In order to grow up strong and well, it is necessary that you should have some exercise every day in the open air, such as a brisk walk or playing games. It is important that you should continue this exercise, as usual, throughout the period, since by so doing you will probably prevent the onset of monthly discomfort and pains later on. If you are troubled with slight headache or backache, or a sense of fatigue, or slight pain during the period, you should take a brisk walk or

play games, or do some work in the house or garden, involving bending movements of the body. If you give up all exercise, more especially if you lie down, your aches and pains will be prolonged and increased in severity.

" 4. If you feel ill at the period and are not able to carry on your usual occupation, your doctor should be consulted. Any ailments associated with the period are more easily cured while you are young than after they have been established for years."

The treatment of dysmenorrhœa by opium, or hot gin and water, is absolutely to be condemned. The life of many a young girl has been ruined from the habit thus acquired. Nurses particularly should be careful about this. It is a fact that in many of these cases the victim was, in the first instance, advised to take the opiate by a nurse, or the nurse herself acquired the habit during her hospital training, more especially since in these circumstances it is a comparatively easy matter to get possession of the drug. The " Dangerous Drugs Act " has reduced materially the number of such victims.

If the advice of a doctor cannot for the moment be obtained, there is no harm in the nurse advising small doses of aspirin, antipyrin, hot ginger and water, or sal volatile in cases of colicky dysmenorrhœa not associated with the discharge of clots or a membrane. A hot-water bottle applied to the vulva, in which situation it gives far greater relief, if any, than if applied to the abdomen, and rest may be tried.

Congestive dysmenorrhœa in many cases is relieved by rest, warmth and saline aperients.

The doctor may wish to ascertain whether his patient is suffering from membranous dysmenorrhœa. In this case he will direct the nurse to save " everything that is passed," to enclose it in muslin and then to wash it in relays of water. The blood and blood-clots will thus be disposed of, and any membrane present will be retained in the muslin for future examination.

If the dysmenorrhœa is really so bad that it cannot be controlled by the usual drugs, or by such a simple operation as dilatation of the cervix, and it is entirely preventing the woman following her usual occupation, some doctors, as a

temporary relief, will order an opium suppository without enlightening the patient, but the only proper treatment in such cases is to stop menstruation for good. It need hardly be added that such a method of relief is only very rarely sanctioned by the doctor.

Dysmenorrhœa associated with imperfect development of the genital organs or other evidence of a hormonal deficiency suggests the administration of œstrin or progesterone, but such treatment, up till now, has not been very successful.

Intermenstrual Pain.

This is a condition in which women complain of pain, more or less severe, occurring regularly between the periods. A majority of those women who complain of pain of this character suffer from dysmenorrhœa and some increase in the menstrual loss. There is reason to think that in these cases the pain is due to some abnormal action of the ovarian secretion. One theory is that the pain is due to the closure of the abdominal ostium of the Fallopian tube by adhesions following an infection, the retained secretion of the tube stretching it and the pain disappearing when the pressure in the tube forces the retained fluid into the uterus. The pain is certainly more common in women who have had children, and who have, therefore, incurred a greater risk of infection. Another theory is that the outer surface of the ovary being abnormally tough ovulation is accompanied by pain. Not infrequently, when the abdomen is opened, because the tube can be felt to be enlarged, the outer covering of the ovary is found to be very thick or to be covered with dense adhesions, or the Fallopian tube is found to be dilated (hydrosalpinx).

TREATMENT.—

Patients complaining of intermenstrual pain should be examined by a doctor who, if any local cause is discovered, will be able to recommend the appropriate treatment.

Abdominal Pain.

The symptom of abdominal pain is far too wide a subject to be discussed at all fully, in such a book as this, arising as

it does from so many causes, medical, surgical, gynæcological and obstetrical.

Pain associated with the genital organs may be acute, chronic or colicky.

Acute Pain.—

A sudden and very acute attack of abdominal pain in a woman is, perhaps, more frequently due to a ruptured tubal gestation, or tubal abortion, than to any other cause. One of the distinctive situations for the pain in such circumstances is in the shoulders, which disappears when the patient sits up, the pain being due to the irritation of the blood as it touches the diaphragm. An acute abdominal pain during labour is associated with tonic contraction of the uterus and concealed accidental hæmorrhage. An acute abdominal pain in the loins in a pregnant woman may be due to pyelitis or pyelonephritis. This pain is accompanied by marked tenderness in the loin and, if on the right side, it is often mistaken for appendicitis, or more rarely for biliary colic. Epigastric pain, probably due to involvement of the liver, is complained of by pregnant women who are in imminent danger of having an attack of eclampsia. A fibroid of the pregnant uterus may undergo red degeneration and be the seat of pain. During, or apart from, pregnancy an ovarian tumour may undergo torsion, or become infected, causing great pain. More rarely, a pedunculated sub-peritoneal fibroid may be the cause of pain. Following labour, general peritonitis, pelvic peritonitis and pelvic cellulitis may give rise to severe pain.

Chronic Pain.—

The detection of the cause of a chronic pain, or aching, may be difficult. In the first place one has to " size up " the patient, as it were. Women will walk into the outpatient or a doctor's consulting room and state that they are suffering " frightfully " and that the pain is " agonizing," " terrible," or " something shocking," and that they are " unable to stand any more." Their looks belie them. A similar type of woman, in other circumstances, will maintain that she has vomited every meal for the last 2 weeks, and yet she looks fairly well nourished. As a general rule the woman who describes

her pains so graphically is also most intolerant of an internal examination, so that although the greatest care is used she will resist, cry out and declare that any movement of the uterus, or palpation of the vagina and its fornices, causes intense and intolerable pain. In but a very few of these cases can any cause for the pain be found. The victims are often run down, more or less anæmic, have usually too much work to do and get too little rest and perhaps no holidays, while their diet may be insufficient or inappropriate ; they are suffering from neurasthenia.

Some patients complain of a dull aching pain in the lower abdomen, which is commonly due to enteroptosis or the drag of a chronically loaded pelvic colon in cases of unrecognized constipation, the latter being generally cured by Epsom salts.

Some women complain of abdominal pain during pregnancy, especially those who have previously given birth to a child or children. This is most commonly due to the drag of the heavy uterus on its ligaments. When the uterus is retroverted, backache may be a complaint. Since the pelvic joints are more movable during pregnancy, walking may become painful and the joints may ache. Towards the end of pregnancy, the presence of the head of the child may cause cramp in the legs. An excessive amount of liquor amnii will cause abdominal pain. The causes of acute pain are referred to under that heading.

A dull-aching pain is associated with pelvic inflammation, and if, in addition, there is a history of repeated and acute attacks of abdominal pain lasting a day or two, such a diagnosis is almost certain, the acute attacks signifying a further involvement of the pelvic peritoneum from a septic Fallopian tube. The pain of pelvic inflammation is relieved by lying down. Tumours of the pelvic organs, both innocent and malignant do not, as a rule, cause pain except as the result of their pressure, unless if innocent they have become infected, bleeding has taken place into them, or if malignant the growth has extended beyond the tumour. The pain of malignant disease is not relieved by rest and is worse at night. Fibroid tumours of the uterus are painless and if, therefore, a patient with such a tumour complains of pain, or tender-

ness, or both, this signifies, as a rule, either that the tumour has undergone degeneration, or that cancer has become engrafted upon it. An over-full bladder from retention of urine is a source of extreme discomfort if not of real pain. A favourite diagnosis of the cause of pain in one or other iliac regions is that of " ovarian trouble," or " adhesions." The only " ovarian " indication about it in many of the cases is that the pain is felt over the ovarian region. If the patient is submitted to operation it is very rare to find the ovaries diseased or adhesions. It takes a long time to convince those women who imagine, or have been told, that their pain is ovarian in origin or due to adhesions, if one can ever do so, that the pain is not due to such a cause.

Colicky Pain.—

Intermittent abdominal pain of a severe nature is connected in gynæcological practice with threatened or inevitable miscarriage, extra-uterine gestation, or with the efforts of the uterus to expel a submucous fibroid or a fibroid polypus. In all these conditions there is also some uterine bleeding.

The colicky pain of dysmenorrhœa has already been dealt with.

Backache and Pelvic Pain.

This variety of pain, which is of a bearing down and aching character, is generally attributed, and not necessarily by the laity, to some abnormal condition of the genital organs, such as misplacement of the uterus. Such a diagnosis may be quite wrong and not infrequently leads to various methods of treatment, such as tampons, pessaries, massage and electricity which do no good, may do harm, and lead only to disappointment. It may be confidently stated that, as a rule, backache is not due to any abnormal condition of the genital organs. It is true that prolapse of the uterus does give rise to a bearing down pain and backache which is relieved by rest and by proper treatment. On the other hand, backward displacement of the uterus, which is so often blamed for backache, does not cause the least discomfort unless there is in addition a fibroid, subinvolution, pelvic inflammation, adhesions fixing the uterus in its abnormal position, marked

congestion or prolapsed ovaries in addition. If an ovary gets imprisoned below a retroverted uterus it will cause a dull-aching backache, and some women with very bad constipation complain also of a similar pain, but more on the left side. As in such cases regulation of the bowels cures the pain it may be that the latter is due to pressure of the loaded rectum on the ovary. Malignant disease of the uterus and chronic pelvic inflammation may be the source of backache.

Backache may be due to osteo-arthritis, tubercle or malignant disease. The commoner causes of backache are sacro-iliac strain, fatigue and chronic lumbar strain.

Strain of the Sacro-Iliac Joint.—This is the commonest cause of persistent backache in the lower part of the back. There is pain in the sacro-iliac joint and tenderness on pressure over the posterior superior spine of the ilium. It is common after childbirth. The pain, which is worse at night and after exertion, is elicited first by flexing the thigh of the patient, then extending her leg, and lastly testing the sacro-iliac joints by moving the iliac bones. The pain is generally relieved by fixation with an appropriate firm bandage round the hips.

Fatigue and Posture Backache.—This is due to muscular and nervous fatigue. It is of a dull-aching character and is made worse by exercise. This variety is found in women who have to stand or sit for many hours, the latter perhaps in the faulty position of bending over desks. In those women who have to carry heavy weights and in those who have to use the muscles of their spine continually to maintain a correct position, as obtains in the later months of pregnancy, and in many women who wear high-heeled boots, fatigue backache may be the cause. It often happens that, in addition to the faulty position, the victims of fatigue backache are " run down " and anæmic. It is worse during the day, and is relieved by sitting or lying down.

Chronic Lumbar Strain due to rupture of some of the deeper fibres of the erector spinæ muscle and deposition of fibrous tissue. It comes on acutely with a sharp stabbing pain due to some unusual movement. When the condition becomes chronic there is local tenderness over some part of the erector spinæ and a limitation of movement due to spasm of the

muscle. Frequently a degree of neurosis is present in addition. Such cases can be cured by intensive manipulation of the joints under an anæsthetic, followed by massage and exercises.

Coccygodynia.

Pain in the coccyx is due to neurasthenia or traumatism. The neurasthenic woman will fancy that there is something wrong with the " bottom of her spine " and will complain of intense pain when sitting down. A local examination fails to disclose any local affection. Traumatic coccygodynia follows a blow, fall or difficult labour resulting in fracture of the coccyx and is easy to diagnose. There is severe pain when the coccyx is moved and the coccyx is found to be fractured. The history of some injury will complete the diagnosis.

Dyspareunia.

Dyspareunia signifies difficulty or pain, or both, in sexual congress.

Difficulty, and perhaps impossibility, is incurred if the hymen is rigid and unruptured, if the cervix is abnormally long, reaching in some cases even so far as the vaginal orifice, if the uterus is prolapsed so that the cervix fills the vaginal orifice, if the vaginal orifice is too small, or there is marked disproportion between the male and female genital organs, difficulty, and perhaps impossibility, will result from purely mechanical reasons.

Pain may be due to one of the following causes : a torn and inflamed hymen, inflammation of the vulva or vagina, an ulcer or fissure in the neighbourhood of the vaginal orifice, a sensitive urethral caruncle, a retroflexed uterus which is tender on being touched, ovaries which are prolapsed, diseased Fallopian tubes or peritonitis.

Pain and difficulty (vaginismus) is due to a spasmodic reflex contraction of the levatores ani and sphincter muscles. Such a condition may be purely of nervous origin or the spasm may be induced by some local condition.

Treatment.—The cause must be treated if it can be discovered. In many cases of vaginismus a cause cannot be found when the muscles referred to are stretched or divided under an anæsthetic.

CHAPTER XI.

STERILITY.

THE causes of barrenness in women can often be determined, and often cannot be determined. With regard to the latter, it is common knowledge that a marriage may prove sterile, and yet if the husband and wife are divorced and again marry the new union may be fertile. It is obvious that in the case of the first marriage the spermatozoon and oöcyte were not suited to each other, whereas in that of the second marriage they were suited. It is not possible here to carry the matter farther than this, but with such knowledge the breeders of horses, cows, and other animals are, in many cases, able successfully to combat sterility in their stock by changing the sire.

The causes which can be determined are either associated with the male or with the female.

Male Sterility.

CAUSE.—

1. The spermatozoa being dead, malformed or absent.
2. Obstruction in the vas deferens due to previous inflammation.
3. Disease or removal of the testes.
4. Some condition of the urethra which prevents the semen being deposited in the vagina, such as a stricture or hypospadias.
5. The mechanism of emission being imperfect; the man may be incompetent.

Sterility in the male is more common than is generally recognized, some authorities stating that in at least 20 per cent. of sterile marriages the disability is on the side of the husband. Such knowledge is of great importance, for it is not an uncommon occurrence for a woman to be operated upon for sterility without any investigation being made with

respect to her husband. *A woman should never be subjected to any operation, having for its object the cure of sterility, until it has been ascertained that her husband is competent and that his spermatozoa are normal.*

Female Sterility.

The causes may be divided into two groups, absolute and relative.

Absolute Sterility.—A woman cannot conceive in the absence of her ovaries, Fallopian tubes, uterus or vagina, either from malformation or operation.

Relative Sterility.—This group, comprising the majority of cases of barrenness in the female, indicates some condition interfering with the progress of the spermatozoon to the oöcyte, or which diminishes the vitality of the spermatozoa, or interferes with the implantation and growth of the zygote.

This group can further be divided into two classes; the one in which some physical signs, indicating defect in the sexual organs, can be found, the other in which the latter appear to be normal.

PHYSICAL DEFECT PRESENT.—Those enumerated under dyspareunia. Many women afflicted with a backward displacement of the uterus, or with a submucous fibroid, do not conceive until the uterus has been replaced or the fibroid removed. On the other hand, it must be admitted that a vast number of women, so circumstanced, have no difficulty in conceiving and give birth to healthy children.

The administration of radium, or radon, to the uterus and of X-rays to the ovaries will nearly always result in sterility.

PHYSICAL DEFECT ABSENT.—The following conditions appear to have a distinct bearing on sterility :—

Abnormal Function of the Endocrinal Glands.—A reference to page 21 will indicate that pregnancy depends on the normal secretions of the ovaries and of the anterior portion of the pituitary gland. The usual investigation with respect to these is by an estimation of the basal metabolic rate, a deficiency in which is associated with sterility, for the time being at anyrate.

Spasmodic Dysmenorrhœa is not uncommonly associated with sterility. It is a fact that dilatation of the cervical canal,

undertaken to cure dysmenorrhœa, in many cases also cures the sterility, and even in the absence of menstrual pain such a dilatation not infrequently leads to conception. It is difficult to understand why this should be since the cervix may appear to be perfectly normal, and however small its canal, short of complete obstruction, it is always sufficiently large to allow of the easy passage of spermatozoa.

Vaginismus may be purely of nervous origin, but the pain and distress of attempted coitus may be so great that penetration is impossible.

Deficiency of the Sex-sense is quite common in women who are sterile. It may be that in such cases the sex hormones do not function normally. Its presence, however, is not essential to conception, since women have become pregnant as the result of brutal rape, or after connexion while unconscious. There are many instances on record, nevertheless, in which the only time the woman conceived was when she had her first and only orgasm.

Profluvium Seminis, or expulsion of the semen from the vagina immediately following coitus, occurs in a large number of women who are sterile. It is also a well-known phenomenon in sterile mares, and in the latter can at times be cured by injecting the semen directly into the uterus. The number of spermatozoa deposited in the vagina varies between 3 and 6 hundred million ; and since it requires only one spermatozoon to fertilize the oöcyte it would seem impossible that all should be expelled. The fact, however, that Nature provides such a vast number of spermatozoa to be available for the fertilization of one oöcyte, rather points to the fact that it is not so easy for an oöcyte to be fertilized as might be thought, and that, therefore, by the expulsion of a large portion of the semen the chances of fertilization become correspondingly lessened.

Age.—Women most frequently become pregnant between the ages of 18 to 30. After 30 years of age the occurrence of pregnancy becomes progressively lessened, and over 40 it is but slight.

General Condition.—The state of the general health of the woman has some bearing on sterility. It is a matter of common observation that married women who gain weight

rapidly may be for the time being sterile, and that when the excess of fat has been lost pregnancy ensues.

TREATMENT.—

Those cases due to an abnormality of the normal secretions of the ovaries are treated by an injection of their respective hormones.

Those cases of sterility in which an abnormality otherwise cannot be discovered, either in the husband or wife, are sometimes cured by certain operations. The most common of these is dilatation of the cervix, with or without curetting. Some authorities advocate the latter, believing that a new endometrium may favour the implantation of a fertilized ovum, this on the assumption that the cause of sterility is the failure of implantation, or, as the medical student more tersely put it in his final examination, " a new tenant prefers a new wall paper." It is not known in what percentage of cases such a treatment is successful, but every gynæcologist has had many successes after dilatation of the cervix—and many failures. From this it is obvious that if the opinion of the nurse was sought as to the advisability of such an operation, as it not infrequently is, her answer should be that it is most certainly worth trying. Another method of treatment, in similar circumstances, is that of enlarging permanently, by a plastic operation, the external os and cervical canal (Pozzi's operation).

Other methods of treatment, about which nurses may be supposed to have knowledge, are the inflation of the Fallopian tubes with carbon-dioxide gas or air, and the injection into the Fallopian tubes of an oily solution of iodine known as lipiodol.

Inflation of the Fallopian Tubes.—

If the Fallopian tubes are obstructed either by disease, or by kinking due to adhesions or backward displacement of the uterus, the oöcyte cannot get into the tube or the spermatozoon cannot reach it. To ascertain whether one or both tubes are blocked carbon-dioxide gas is injected into the uterus, with the result that if the Fallopian tubes are patent the gas escapes into the peritoneal cavity ; if not the tubes are distended.

Which of these two events is happening is determined by hearing the gas escaping into the peritoneal cavity when the ear or a stethoscope is applied to the abdomen, and also by an instrument called a manometer, attached to the bottle which is delivering the gas into the inflation tube. This manometer registers the pressure of the gas in the bottle and in the uterus and tubes. If the Fallopian tubes are patent the needle on the manometer rises steadily till it suddenly stops and commences to fall which is an indication that the gas is entering the peritoneal cavity. The margin of safety is a pressure of 220 mm. of mercury, a pressure beyond this may rupture the tubes. A certain number of sterile women became pregnant after inflation, although their Fallopian tubes had been found not to be patent. It must be supposed that in such cases obstruction, whatever its nature, was easily overcome by the pressure of the carbon-dioxide gas.

Injection of Lipiodol.—The injection of lipiodol is made to determine which part of the canal of the Fallopian tube is obstructed, if any. The lipiodol is injected into the uterus and directly afterwards the patient is X-rayed, and the outline of the uterine cavity and lumen of the Fallopian tubes, filled with lipiodol can be clearly seen on the screen and a radiogram can be taken. If the tubes are patent then some of the lipiodol will be found to have trickled into the peritoneal cavity. If there is an obstruction in the Fallopian tube, or tubes, then the lipiodol will be held up at the point of obstruction which can be clearly detected. Just as inflation was found to have a certain value in curing sterility in those patients in whom the Fallopian tubes were only slightly obstructed, the injection of lipiodol in similar circumstances has been successful.

PREPARATION OF THE PATIENT.—

The inflation is better performed if possible without an anæsthetic since certain signs may arise during the test which are useful for purposes of diagnosis. If the patient complains of pain in the iliac and hypogastric regions it shows that some pelvic abnormality is present. Pain or discomfort in the shoulder is a symptom that the tubes are patent and is due to the gas rising up to and irritating the diaphragm.

The test should be carried out about midway between the periods, glycerine plugs having been inserted in the vagina which softens the cervix and allows the inflation tube to be more easily inserted. The night before the operation the patient should be given an aperient.

Contra-indications.—In any case in which there is bleeding from the uterus or the menstrual period is just due. Inflammation in any part of the genital tract, and when pregnancy is suspected. If the patient is very nervous she had better be anæsthetized.

The injection of lipiodol is not without danger. Rarely pelvic inflammation resulting in an abscess has followed. A stenosed tube, but somewhat patent, may become permanently blocked.

CHAPTER XII.

VAGINAL DISCHARGES.

UNDER this heading is included any discharge escaping from the vagina, other than the normal menstrual discharge or an excess of blood. Such a discharge may be coming from the body or neck of the uterus, from the Fallopian tubes, vagina, bladder, rectum or peritoneal cavity. The mucous membrane of the Fallopian tubes and uterus, the lining of the vagina and skin and glands of the vulva, in their normal states, secrete a certain amount of discharge, while that from the uterus, vagina and vulva may, in such circumstances as just before menstruation, during pregnancy or sexual stimulation, be excessive, without being pathological. It will be useful, therefore, first of all shortly to describe the normal discharges.

Fallopian Tube.—The mucous membrane of the Fallopian tube secretes a small quantity of watery fluid.

Body of the Uterus.—The glands of the corporeal mucous membrane secrete a small quantity of watery fluid.

Neck of the Uterus.—The glands of the cervical mucous membrane secrete a clear, transparent, viscid (like the white of egg) and alkaline fluid, the amount of which varies in different individuals. At the vulval orifice this secretion has lost its transparency, and is yellowish and flaky from being mixed with the vaginal discharge.

Vagina.—The secretion is due to an oozing from its surface. Its white, at times yellowish-white, colour is due to its mixture with the epithelial cells which have been shed from the vagina, after they have undergone fatty degeneration, to which its flaky appearance is due also. Its reaction is acid.

Vulva.—The following secretions have their origin in the vulva. Watery from the sweat glands, oily from the sebaceous glands, glairy and transparent from Bartholin's glands. Through the agency of one or more of these secretions the

inner surfaces of the labia majora, and the structures which they cover, are kept moist. In women who are not so cleanly in their habits as they should be, the fatty degenerated epithelial cells are apt to collect as a yellowish granular material, especially in the neighbourhood of the clitoris and labia minora.

Any discharge from the genital passages, therefore, which has one or the other of these characteristics, and is not excessive, except in those temporary circumstances mentioned above, when the glands are in a hyperactive condition, must be looked upon as normal. The difficulty is to determine what quantity may be regarded as excessive. A good guide is whether the discharge is sufficient to soil the underwear unduly, to make the surrounding parts irritable and sore, or whether it is necessary to use a diaper.

Abnormal discharges from the genital passages can be well classified according to their appearance.

Mucous.—To such a discharge is properly given the name of leucorrhœa or " the whites " ; these terms are often incorrectly applied to all discharges which are not bloody, watery or fæcal in character.

An excessive mucous discharge, other than that of a temporary nature, may be due to the fact that there are more glands to secrete, the best examples of which are associated with subinvolution of the uterus and chronic cervicitis. Inflammation of the cervical mucous membrane is more likely to occur as the result of infection during labour, or the puerperium, or in women who are not virgins ; nevertheless, there are always septic organisms in the neighbourhood of the vulva and lower third of the vagina, and if, for any reason, the resistance of a virgin is lowered, these organisms may travel up the genital canal and infect the cervical mucous membrane. Chronic endocervicitis often results in the formation of an *erosion* on that part of the cervix which projects into the vagina.

Muco-purulent.—This is due to the inflammation of the cervical mucous membrane resulting in the formation of pus.

Pus.—Pus escaping from the vaginal orifice may have its origin in the Fallopian tube, ovary, uterus, vagina, pelvic peritoneum or cellular tissue. The commonest causes of

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a purulent discharge from the vagina are acute vaginitis, or the irritation of a foreign body in the vagina, generally a neglected pessary. A purulent discharge from the uterus is due either to an acute infection generally following labour, miscarriage or gonorrhœa, or to the sloughing of a tumour in the uterus. A purulent discharge may also be due to the chronic infections known as senile vaginitis and senile endometritis.

Pus, arising in some other situation in the pelvis may, as a result of ulceration, be discharged through the vagina, or more often through the rectum. Such conditions, therefore, as a pyosalpinx, ovarian abscess, or a pelvic abscess may be the origin of a purulent discharge from the genital passages.

Water.—A watery discharge escaping from the genital passages may come from the body of the uterus, bladder or ureter. If there is a hole between the bladder and vagina, as the result of ulceration or injury, urine will escape into the vagina. Lastly, and unfortunately, it sometimes happens that during the operation of hysterectomy a ureter is severed, and the injury escapes notice, or the ureter is denuded of its blood supply and sloughs later. In such cases the cut, or sloughed end, of that part of the ureter which is attached to the kidneys may discharge urine into the pelvic cavity and this in time escapes through the abdominal wound. Just as often, however, the cut end becomes engrafted into the top of the vagina, in which case the urine is discharged through that canal.

Watery Blood.—A watery discharge which is coloured with blood is most frequently due to carcinoma of the Fallopian tube, uterus or vagina. As cancer of the uterus is by far the commonest of the three, the discharge is generally due to such a cause. Rarely a watery blood discharge is due to mucous polypi of the uterus.

Fæcal.—If there is a hole between the rectum and vagina fæces will escape *via* the latter canal. Such holes may be due to injury during, or ulceration following, childbirth, or to ulceration due to syphilis, tubercle or cancer, or to the pressure of a neglected pessary.

Offensive.—Some of the discharges mentioned above may be offensive. The first thing about a discharge that may

strike a nurse is its offensive odour. A very good example of an offensive odour being the first thing to warn a nurse of a serious condition is that of a neglected incomplete miscarriage. In such circumstances the nurse may notice the smell when going upstairs before she enters the bedroom. The discharge due to an ulcerating carcinoma, sarcoma or fibroid is intensely offensive, and that due to the presence in the vagina of a foreign body, senile endometritis or senile vaginitis may be nearly as bad. Discharges contaminated with fæces or urine are easily recognized from their odour. Except in the cases of fæcal and urinous discharges, the smell is due to the action of saprophytic organisms on the dead tissue, or on the secretions retained by the foreign body.

The importance of a vaginal discharge depends on its character and on the age and civil state (married or single) of the patient.

From Infancy to Puberty.—In many an apparent cause cannot be found for the discharge. Before puberty the vagina, uterus and Fallopian tubes, being undeveloped, are very rarely the seat of disease. In most instances, therefore, under this heading the discharge flows from the vulva, and may be associated with anæmia, debility, threadworms, dirt, or due to injury or gonorrhœa. Rarely the vagina may be at fault, in which case the discharge is due to inflammation caused by gonorrhœa, or some acute fever. Foreign bodies which have been inserted into the vagina by the child, such as hairpins, pebbles, or fruit-stones, may also be a cause.

Gonorrhœa may follow criminal assault, or it may be caused by infection from towels or bed-pans which have been soiled by some adult suffering from this disease. There are on record several outbreaks of this disease which has been spread by towels or bed-pans used in institutions for girls.

It is also well to remember that mothers are wont, at times, falsely to accuse men of assaulting their daughters, because the latter are suffering from leucorrhœa.

From Puberty to Marriage and after.—From puberty onwards a number of females suffer from leucorrhœa a day or two before, and/or a day or two after, menstruation. This is due to congestion of the uterus, and is so common that it may almost be accounted as normal.

Other causes may be anæmia, constipation, diabetes, tumours of the genital organs, misplacement of the uterus, erosion of the neck of the uterus, endometritis, vaginitis or foreign bodies in the vagina.

The commonest causes in young women are subinvolution of the uterus and vagina, and septic infection following puerperal sepsis or gonorrhœa.

As a rule 6 to 8 weeks are required for complete involution of the uterus and vagina to take place, and when this does not occur, the increased number of glands in the mucous membrane accounts for the leucorrhœa.

If the vagina and neck of the uterus protrude outside the vulva the discharge may be due to ulceration thereof.

In puerperal sepsis bacteria gain access to the genital tract and set up inflammatory changes which may become chronic.

In gonorrhœa the discharge is due to the acute inflammation caused therefrom.

It must be remembered that cancer, fibroids and erosions of the cervix are much commoner in married women.

The only foreign body likely to be found in the vagina and causing a discharge is a neglected pessary. The list of the foreign bodies found in the vagina in certain circumstances, due to brutal assaults, an endeavour to evade the Customs, or placed therein by neurotic women, is almost unbelievable, including as it does jam pots, small bottles, a pig's tail, money, jewellery, and in one case a small bust of Napoleon.

After the Menopause.—In addition to many of the conditions mentioned above, leucorrhœa at this age may be due to inflammatory conditions of the uterus and vagina known as senile endometritis and senile vaginitis.

It is, however, most important to remember that the menopause is the commonest time for malignant disease of the genital organs to appear, and that, although a discharge of blood is generally the first symptom of such a disease, nevertheless, *any woman who, at this time of life, is suffering from a leucorrhœal discharge should consult a doctor.*

Symptoms and Signs.—

From the nurse's point of view there is but little to be said concerning the diagnosis of the source of the discharge. Ob-

viously a nurse can be of assistance to the doctor by telling him the nature of the discharge the patient has, if a specimen has not been saved, and there should be no difficulty in the nurse deciding whether a discharge is mucous, purulent, contaminated with blood or fæces and whether it is offensive. In the case of a watery discharge, however, the doctor may want to know whether this discharge is urine. Such a discharge follows some cases of hysterectomy or childbirth, due in the former to injury of the ureter and in the latter to a vesico-vaginal fistula which may also be due to cancer. Apart from its smell, normal urine may be detected by soaking a piece of blue litmus paper in the discharge, which will then turn red.

TREATMENT.—

The treatment, which varies with the cause, comes under the province of the doctor. It may include some form of vaginal douching, and the nurse may be directed to carry this out (see p. 213).

NURSING.—

As the discharge is, in many cases, irritating to the vulva the nurse can usefully smear the parts with vaseline, or better still with a mixture of castor oil and zinc ointment in equal proportions. For offensive discharges, as with others, the nurse will carry out the treatment, perhaps douching, ordered by the doctor, and offensive discharges particularly will require a change of diapers and draw-sheets whenever they are soiled. Pessaries are not so frequently used as formerly, but a nurse, if she has the opportunity, must be careful to impress upon a woman wearing one the great importance of a daily douche to keep the instrument clean, and of having the instrument changed by a doctor every 3 months.

Many women suffering from a vaginal discharge due to chronic endocervicitis are obsessed with the idea that such a discharge is doing them a great deal of harm and that their "strength is being drained away." Such women are constantly seeking advice, or trying one or other remedy. If the cause of the discharge cannot be cured by local applications, or by some operation (indeed in slight cases such procedures

may be entirely unwarranted), and if the discharge is troublesome because of the soiling of the underlinen or the patient having to wear a diaper, an absorbent wool tampon, inserted into the vagina in the morning and removed at night, will be all that is necessary, and the patient may be assured that her health is not being affected.

PRURITUS VULVÆ.

Pruritus vulvæ, which is characterized by severe itching of the vulva, is a very distressing complaint. It may be present without any ascertainable cause, or it may be secondary to some local condition.

Primary Pruritus Vulvæ.—

This is due to a neurosis.

Secondary Pruritus Vulvæ.—

This is due to congestion or irritation.

Congestion of the vulva may be due to the extra flow of blood to the parts during the few days preceding menstruation, or to the menopause. Its occurrence in pregnant women is attributed by some authorities to a minor toxæmic condition.

Irritation.—The vulval skin may be irritated by pediculi pubis, threadworms, eczema, herpes, leukoplakia, or dirt. Urinary or vaginal discharges may also be the cause.

SYMPTOMS.—

The itching is paroxysmal in character, or more or less constant, and may extend over the perineum and adjacent areas. It is generally worse at night or after exercise, when the patient is warm. It tends to become gradually more troublesome, and the scratching, which the sufferer finds necessary for her relief, only makes matters worse, by causing an eczematous condition of the vulva.

The irritation may become so intolerable that the patient will shun all society and even keep to one room, while there are cases on record in which the patient became insane and committed suicide, apparently from the great distress and loss of sleep occasioned by the constant irritation.

Signs.—

The urine of every woman, and especially in children and young women, complaining of pruritus vulvæ should always be examined for sugar. Also the fæces should be examined for threadworms. In some cases the nurse may then easily arrive at a correct diagnosis. The disease known as leuko-plakia of the vulva (see page 138), when well marked, may be diagnosed by a nurse who has had gynæcological experience during her training. It is most important that such a diagnosis should be made at the earliest opportunity since it is an ante-cedent condition to carcinoma of the vulva, and adequate treatment in its early stages will lead to a cure.

Treatment.—

If a local cause can be found, the appropriate treatment will suffice. If not, the doctor will prescribe lotions or ointment, though frequently their beneficial effect is most disappointing. X-rays at times give relief, and in some cases excision of the whole or portion of the vulva has been found necessary.

For pruritus vulvæ associated with the menopause, the administration of œstrin has met with success.

Nursing.—

The local applications to prevent the vulva being con-taminated, and within the powers of the nurse, have already been mentioned. Strict cleanliness will in many cases be very beneficial.

CHAPTER XIII.

DISTURBANCES OF MICTURITION.
SUPPRESSION OF URINE.

THE following disturbances of micturition will be discussed : retention, incontinence, frequency, pain, difficulty, imperative, and suppression. Although such disorders are found associated with other diseases, they may be distinctly related to those of an obstetrical or gynæcological nature.

RETENTION OF URINE.

If a woman is unable to micturate, although the urine excreted by her kidneys is passing into her bladder, the latter organ becomes unduly distended, and the condition is termed retention of urine, and is either of nervous or mechanical origin.

CAUSES.—

Interference with the Nervous Mechanism.—*Hysteria.* —This may be the cause in young women who crave for sympathy, and whose nervous system is in an unstable condition.

Unusual Position.—The retention may be due to the patient having to pass water on her back.

Pain in the Urethra or Bladder.—If the act of micturition gives rise to severe pain the woman will decline to urinate as long as possible, and in this way retention sometimes results. The following are causes of pain in the urethra : inflammation generally due to gonorrhœa ; urethral caruncle and cancer of the urethra. Pelvic peritonitis causes painful micturition by the contracting bladder pulling on the inflamed peritoneum.

Retention, apart from that due to the unusual position, also occurs in some patients for a day or so after labour, and may be due to pain caused by the necessary contraction of the abdominal muscles which may have been bruised during the 3rd stage of labour, or to the pain caused by the urine

flowing over the vulva which has been torn, more particularly in the region of the urethra.

Shock.—Retention of urine is very common after operations, especially those on the abdomen, vagina, perineum, and rectum, and is due to the micturition centre in the spinal cord being temporarily affected by nerve impulses during the operation. Injury to the nerve supply of the bladder, as may happen in the radical operation for cancer of the cervix, is also a cause.

Disease of the Central Nervous System.—In certain diseases of the nervous system the nerve reflex of the bladder is cut off from the higher centres which govern the act of voluntary micturition, the contraction of the bladder, if it does occur, being automatic.

Over-distension of the Bladder or Abdominal Walls.—If a woman holds her water too long the bladder will become over-stretched, then, when she desires to micturate, the bladder muscle will not contract, and retention results. It is not an uncommon occurrence during the first day or so after labour for the patient to have retention of urine, because the abdominal muscles have been so stretched by the pregnant uterus that they cannot press on the bladder to assist this organ to contract.

Pressure on the Neck of the Bladder or Urethra.—The urethra being the muscular canal through which the urine leaves the bladder, it is evident that if the calibre of this tube is sufficiently narrowed, retention must result. The neck of the bladder may be compressed and urethra stretched by the cervix being displaced forwards and upwards when the retroverted pregnant uterus is incarcerated. A swelling in the pelvis such as an ovarian cyst, blood or pus or a cervical fibroid may push the uterus against the neck of the bladder and so cause retention. If a fibroid is almost impacted in the pelvis, an increased amount of blood to the tumour may lead to complete retention of urine. An additional amount of blood flows to the uterus in the week preceding menstruation. The complaint, therefore, of retention of urine just before the period which is relieved by the onset of the period, should warn the nurse that the cause may be that of an impacted fibroid tumour. Ignorance of these facts has often led to

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the condition remaining undiagnosed for some months, especially in those cases in which the loss is not excessive (cervical fibroid).

In the 2nd stage of labour, if the pelvic cavity is somewhat small, or the head of the child not properly flexed, the head may fill the pelvis so tightly that the urethra is pressed upon, and if the bladder has not been emptied frequently during the 1st stage of labour, as it should be, retention may result.

If the vagina is efficiently plugged the urethra must be pressed upon and retention results. The knowledge of this will remind the nurse that before plugging the vagina, the bladder must be emptied, preferably by catheter. Otherwise, to allow the patient to empty her bladder when necessary, the plug has to be taken out too soon.

Cancer of the cervix or vagina may occlude the urethra by extension.

SYMPTOMS AND SIGNS.—

The patient will complain of severe and continuous pain in the lower abdomen, with intermittent exacerbations, and will state that she cannot pass her water. An abdominal examination will disclose a central, soft and somewhat fluctuating swelling above the pubes, pressure upon which causes a certain desire to micturate.

TREATMENT.—

It is most important that the cause for the retention should be ascertained, since, unless efficiently treated, the result will be cystitis.

For hysterical retention relief by catheter may be necessary on the first occasion, but every means should be taken to prevent a further continuance of its use. If a strong purge be given, micturition usually results when the bowels act. Another method is to seat the woman in a bath with hot water reaching to the hips and then, without any warning, to empty a pailful of cold water over her head and body. Retention after labour, and following operations, is treated by an alteration in the position of the patient, sponging the vulva with warm antiseptic lotion, placing the patient on a bed-pan containing a little hot water and by supra-pubic pressure. Some cases

are successfully treated by an injection of pitocin which excites the muscle of the bladder to contract, or by giving the patient a drachm of the liquid extract of ergot in half a pint of soda water to drink. If such harmless measures fail the catheter will have to be used.

For the remaining causes of retention appropriate treatment will be prescribed by the medical practitioner. It may be added that in cancer of, or extending to, the urethra, it may be impossible to pass a catheter, when the bladder has to be drained from an incision through the abdomen.

Residual Retention.—By this is meant that, following over-distension, the bladder does not completely empty itself after micturition. A similar condition is likely to arise of the radical operation for cancer of the uterus, owing to the nerve supply of the bladder being damaged. If there is such a retention and this remains unrecognized the result will be cystitis.

Nursing.—

A nurse will have the first opportunity of suspecting that a patient may have residual urine.

A nurse who has to pass a catheter must be most careful to carry out all the precautions mentioned on page 217.

INCONTINENCE OF URINE.

Incontinence of urine is a term denoting the dribbling away of urine from the bladder irrespective of any wish of the patient.

The following varieties of incontinence may be met with : stress incontinence, true incontinence, incontinence of retention, and nocturnal incontinence.

Stress Incontinence.—

Stress incontinence is a condition in which the urine escapes from the bladder on the slightest exertion. The patient states that if she coughs, sneezes, laughs or strains as when lifting heavy weights, or when dancing, playing golf or tennis she is apt to " wet herself." Such a condition most commonly follows childbirth, which has led to the sphincter of the bladder being torn or unduly stretched.

TREATMENT.—

The sphincter should be tightened by an operation.

In those cases in which an operation is refused or inadvisable a pessary may be inserted.

True Incontinence.—

CAUSES.—

In this condition the urine cannot collect in the bladder because there is a hole leading from it into the vagina (vesico-vaginal fistula) or because the sphincter of the urethra has been badly damaged.

The fistula may be caused by ulceration extending from the vagina into the bladder, due to prolonged pressure of the head of the child during labour, or to laceration of the vagina and bladder when the obstetric forceps were being used.

Cancer, tubercle, syphilis, or a neglected pessary, may also ulcerate from the vagina into the bladder. Lastly, the bladder may be injured during some operation on the vagina.

Injury to the sphincter of the urethra is due to childbirth, or to mechanical dilatation for purposes of a digital examination of the bladder.

The urine may also dribble away from the end of a cut ureter which has been injured or by its blood-supply being interfered with during a hysterectomy. If the ureter sloughs the incontinence appears some 10 days later, the cut or sloughing end being, as a rule, engrafted onto the top of the vagina. The ureter may also be injured during labour when the use of the forceps has resulted in severe laceration of the cervix.

SYMPTOMS AND SIGNS.—

The constant escape of urine causes much irritation and soreness of the vulva and adjacent parts and, unless the dressings are frequently changed, the stale urine remaining thereon becomes very offensive.

TREATMENT.—

If the fistula is due to injury it can be cured by a plastic operation. If due to disease and this can be cured, the fistula will heal.

Incontinence of Retention.—

CAUSE.—

In some cases of retention the pressure of the urine becomes so great that the sphincter at the neck of the bladder is forced open. A small quantity of urine then escapes, and after the immediate pressure is relieved the sphincter again contracts. The retention is, therefore, intermittent and the condition is termed incontinence of retention. Incontinence of retention may occur in a case of an incarcerated retroverted gravid uterus, but usually it is the result of some chronic condition.

SYMPTOMS AND SIGNS.—

The patient will be constantly passing small quantities of urine. The bladder on abdominal examination will be found to be distended and, unless there is cystitis, the urine will be normal, in this respect differing from that associated with the frequent passage of small quantities due to cystitis, when the urine will be offensive, alkaline and contain pus.

TREATMENT.—

The bladder having been emptied with a catheter, the fact must at once be reported to a doctor.

This condition is really more dangerous than complete retention for two reasons. Firstly, if the nurse is careless, and does not notice that only a small quantity of urine is being passed at a time, she will regard the condition as one of frequency only and fail to report the matter to the doctor so soon as she should. Secondly, if she is intolerant (and some nurses do not differ from some doctors in this respect) she will assume that the patient is hysterical, and complaining of the constant call for the bed-pan neglect to take it when asked or postpone doing so. In either case before the retention of urine is discovered, cystitis will have been set up, ending perhaps fatally. One of my patients thus lost her life.

A well-known Professor of Obstetrics has stated his opinion that, in his experience, the majority of nurses fail to notice that the patient is suffering from retention of urine in these cases of incontinence of retention. I have lately received a

report of such ignorance and neglect in a Nursing Home. A doctor was not called in for 10 days when the patient was very ill, and she died of ulceration of the bladder.

Nocturnal Incontinence.—

Generally occurs in young children when the urine is passed unconsciously while the child is asleep.

CAUSE.—

A cause cannot always be found. It may be due to the presence of threadworms, stone in the bladder, polypus of the rectum, very acid urine, epilepsy, inflammation of the vulva, or to infection with the colon bacillus especially in young children.

TREATMENT.—

The treatment of nocturnal incontinence must depend upon the cause.

In the absence of any cause being discovered, the patient should sleep on a hard bed with very light clothing. If young she should be roused when her parents go to bed and made to empty her bladder. Very little drink should be allowed with the last meal of the day. A large reel of cotton may be tied round the waist so that it rests on the spine; this will prevent the patient lying on her back, a position which seems to favour the involuntary expulsion of urine in some cases. Cold baths and a cold douche to the spine are often helpful.

For the medicinal treatment a doctor must be consulted; belladonna is at times employed very successfully, also the correct treatment when the condition is due to the colon bacillus.

FREQUENCY OF MICTURITION.

CAUSES.—

Excessive Quantity of Urine.—Hysteria, diabetes, chronic Bright's disease, a very acid urine or one loaded with oxalates and phosphates.

Pressure on the Bladder.—Pregnant uterus, ovarian tumour, fibroid tumour.

Misplacement of the Bladder.—Cystocele, with or without prolapse of the uterus. An indication that a cystocele may be the cause is the presence of a lump at the vaginal orifice and the fact that the urine escapes from the bladder on the slightest exertion, such as laughing or sneezing. When the patient is at rest frequency is absent.

Disease of the Bladder.—Acute and chronic cystitis, infection with bacillus coli.

Pressure on the Urethra or Neck of the Bladder.—Leading to incontinence of retention.

TREATMENT.—

The passage of an excessive quantity of urine is, in most patients, a serious symptom, and a doctor should be consulted at once. The nurse must be careful to remember that frequency of micturition is also a sign of retention.

PAINFUL MICTURITION.

CAUSES.—

Cystitis, inflammation of the urethra, urethra caruncle, cancer and tubercle of the bladder, pelvic inflammation.

TREATMENT.—

The treatment of these conditions is carried out by the doctor.

DIFFICULT MICTURITION.

This may be due to one or other of the causes listed under Retention, and when due to pressure before the retention becomes complete there will be difficulty.

A common complaint of a woman who has a marked cystocele is that she cannot pass her water before she pushes up the lump.

IMPERATIVE MICTURITION.

This is a condition in which, when a desire to micturate ensues, the woman can hold her water only for a very short time. Unless, therefore, a fitting opportunity can quickly

be secured, she will pass her urine involuntarily. In some cases this "inconvenience" may have been present for many years or from childbirth, and a local examination cannot detect any cause. In others the urine may be excessively acid or there may be an abdominal tumour. In a young woman disseminated sclerosis should be thought of, especially in one who avoids going to "parties".

SUPPRESSION OF URINE.

Suppression of urine, which may be partial or complete, is a condition in which the kidney is not acting properly. In complete suppression the bladder is empty. In partial suppression there is a gradual diminution in the amount of urine passed which latter may contain blood.

CAUSES.—

Inflammation, tumour, or calculus of the kidneys ; occlusion of the ureters by cancer, or by a ligature accidentally applied during some operation in its neighbourhood.

Partial suppression due to renal shock for the first 24 hours, after a severe operation, is not an uncommon occurrence. It must be remembered, however, that the quantity of fluid drunk by the patient for some hours prior to and following an operation is much less than normal. Partial or complete suppression of urine is associated with that complication of pregnancy known as eclampsia. Rare causes are due to an acute toxic degeneration of the kidneys.

SYMPTOMS AND SIGNS.—

Cases of total suppression may last for some days. When the symptoms and signs appear the condition which is termed uræmia consists of such cerebral manifestations as irritability, great mental distress, persistent headache, twitching of the face, contraction of the pupils, drowsiness, and convulsions ending in coma ; intestinal signs such as nausea and vomiting ; respiratory signs such as dyspnœa and Cheyne-Stokes respiration. The pulse-rate is quickened and the temperature sub-normal.

In cases of partial suppression, with recovery of the patient, symptoms are, as a rule, absent.

TREATMENT.—

The quantity of urine passed every 24 hours after an operation will have been carefully measured, so that the nurse will realize a condition of partial or complete suppression.

If the suppression is not due to occluded ureters the doctor will order large draughts of water by the mouth, hot-air baths, dry-cupping to the loins, an intravenous saline transfusion, continuous rectal saline or pilocarpin gr. $\frac{1}{6}$ every 4 hours.

CHAPTER XIV.

DISPLACEMENTS OF THE UTERUS AND THE USE OF PESSARIES.

THE vagina, uterus, Fallopian tubes and ovaries may be displaced downwards. They are then said to be *prolapsed*. The uterus may also be displaced back, bent back, or directed abnormally forwards (Fig. 16). These various displacements may be combined. Prolapse of the anterior vaginal wall is generally associated with prolapse of part of the bladder and the resulting swelling, which appears at the vulval orifice, is termed a *cystocele*. Similarly, part of the rectum may be associated with prolapse of the posterior vaginal wall, the swelling being termed a *rectocele*.

Remembering the description of the structures which keep the pelvic organs in their natural position, the nurse will easily realize why, in certain circumstances, these organs should become displaced.

Backward Displacement.

If the uterus is displaced so that its neck looks forward towards the bladder and its body backward towards the sacrum the condition is termed *retroversion*. If the body of the uterus is bent backwards and its neck is looking in its normal direction towards the sacrum, the condition is termed *retroflexion*. In most cases of backward displacement the retroversion and retroflexion are combined, so that the body is bent back at the neck, and the neck is directed somewhat forwards. These two varieties, therefore, will be described together.

Causes.—

Congenital.

Pregnancy, Labour and Puerperium.

Tumours.

Pelvic peritonitis.

1. *Congenital.*—In some women who have not given birth to a child, and in whom there is no evidence of a tumour or of pelvic peritonitis, the uterus is found to be displaced backwards. It is fair, therefore, to assume that in such
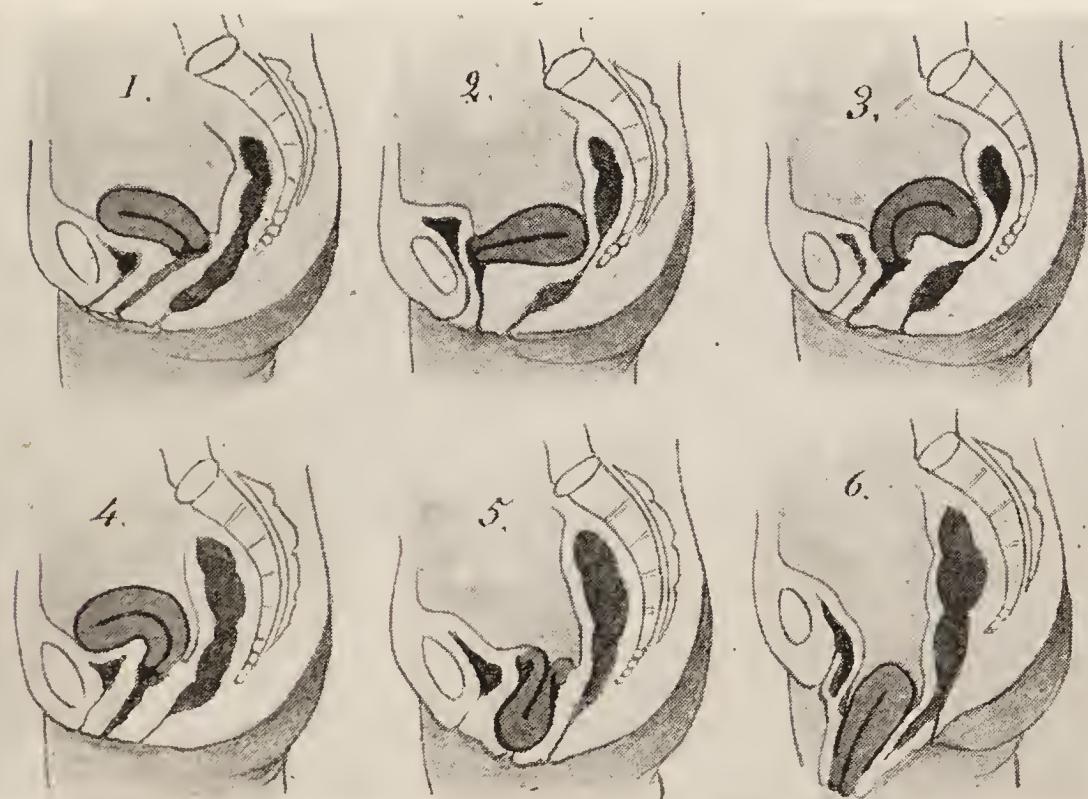
FIG. 16.—POSITION OF THE UTERUS.

1. Normal ; 2. Retroversion ; 3. Retroflexion ; 4. Anteflexion ;
5. Inversion ; 6. Prolapse, also prolapse of the vaginal walls.

patients the displacement may be of congenital origin or, at any rate, due to a misplacement during the development of the uterus between birth and puberty.

2. *Pregnancy, Labour and Puerperium.*—The commonest cause of backward displacement of the uterus is due to the woman having given birth to one or more children. The reason why this should be so is not difficult to understand. Directly after a miscarriage, or a labour at term, the uterus is much heavier than before, in the latter case 2 pounds

instead of 2 ounces. It is soft, its ligaments have increased
in length, and the pelvic floor may have been unduly stretched
or torn. If, then, after a miscarriage or labour, the woman
lies on her back, the heavy, soft and very mobile uterus
falls back onto the sacrum. If the woman is encouraged to
assume such a position, or is not warned against so doing,
the uterus, as it decreases in size, sinks below the sacral
promontory, and the intra-abdominal pressure, acting
through the small intestines, which are now lying against
the anterior surface of the body of the uterus, prevents
this organ from regaining its correct position. After
the pregnant uterus has expelled its contents, certain pro-
cesses take place in it, known as involution, the result of
which is that this organ should return to the position and
almost the same size and condition which is normal to the
unimpregnated woman. The circulation in a uterus which
is displaced backwards is, however, not so satisfactory as it
should be, and so this organ becomes congested, and the
process of involution does not progress so well, the muscle,
instead of becoming firm, remaining soft. When the woman
gets up the uterus might be expected to tilt forwards, but
since it is already being held back by the pressure of the small
intestines, there is no encouragement for it to do so and it very
often remains retroverted indefinitely. Moreover, owing to
the fact that the uterine muscle remains soft it can easily bend
on itself at the junction of the cervix with the body, and so, in
addition to the version, flexion may result.

The following may occur when a retroverted uterus be-
comes pregnant :—

1. The uterus as it increases in size will escape from under-
neath the sacral promontory and the pregnancy will
continue. This is, probably, the commonest ter-
mination.

2. The uterus will empty itself. This is, perhaps, one of
the commonest causes of miscarriage.

3. The uterus, at the 12th week, becomes incarcerated,
this being followed by—

   (a) abortion, common ;
   (b) retention of urine leading, if not adequately
       treated, to cystitis ;
   (c) pouching of the uterine wall, rare.

Rarely retroversion may follow a sharp blow or fall in a woman some 12 weeks pregnant, in whom a full bladder has pushed the uterus back to a horizontal position. In this case the increased intra-abdominal pressure, applied to the top or anterior surface of the uterus, forces it back below the promontory of the sacrum which imprisons it.

NON-GRAVID UTERUS.—

Tumours.—The weight of a fibroid tumour in the wall of the uterus may cause the latter to fall backwards. Likewise an ovarian tumour pressing on the anterior surface of the uterus will do the same. These are rare causes.

Pelvic Peritonitis.—As the result of pelvic peritonitis and salpingitis adhesions may form. These adhesions in time contract, and if they are attached to the back of the uterus they pull it back and fix it. Whether the uterus was in a normal position before the advent of these diseases is questionable. More probably it was displaced backward, and the adhesions having formed fixed it there.

SYMPTOMS.—

These depend on the cause of the displacement. Thus in congenital cases they are usually absent. Following miscarriage or labour, the usual symptoms, if any, are menorrhagia, discharge and backache due to subinvolution of the uterus. The symptoms and signs associated with a retroverted gravid uterus are those of miscarriage or incarceration. The symptoms of incarceration, as a rule, come on slowly and are striking since, with the symptoms of a 12 weeks' pregnancy, the woman will seek the advice of a doctor because she has retention of urine or great frequency in passing water.

In the acute cases the patient will complain of some abdominal pain.

The symptoms of retroversion due to tumours and pelvic inflammation are those of their respective causes.

SIGNS.—

For the most part these will be recognized by the doctor. In a patient suffering from retention of urine due to incarceration of the gravid uterus, the distended bladder forms a

well-marked abdominal tumour, which is central, soft and fluctuating, and pressure thereon causes a desire, on the part of the patient, to micturate. If the nurse has qualified as a midwife she may identify the early symptoms and
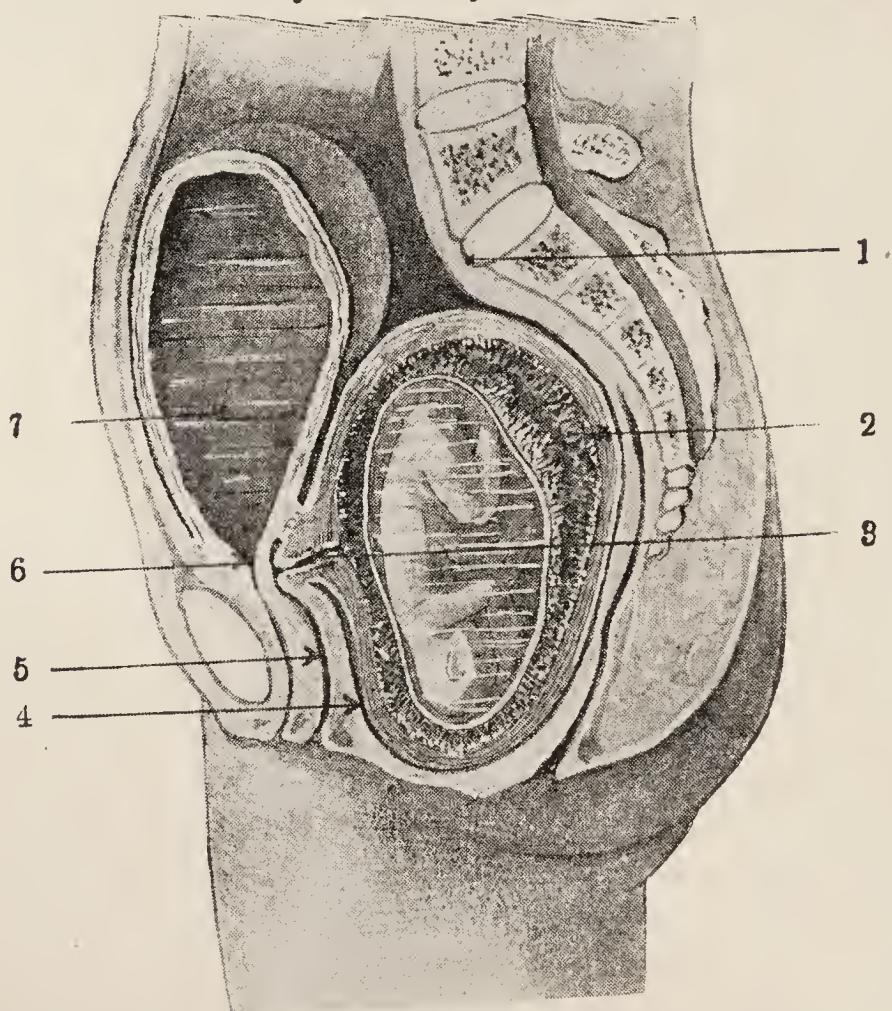
FIG. 17.—INCARCERATION OF THE RETROVERTED GRAVID UTERUS.

Body of woman divided in half showing the body of the uterus im-
prisoned below the promontory of the sacrum and the neck of
the uterus directed forwards and upwards, so stretching the vagina,
flattening the urethra and pressing against the neck of the bladder,
thus causing retention of urine. 1. Promontory of sacrum ;
2. Body of uterus ; 3. Neck of uterus ; 4. Vagina ; 5. Urethra ;
6. Junction of urethra with bladder ; 7. Bladder.

signs of pregnancy. In most cases of retention of urine due to incarceration of the gravid uterus an average of 5 pints of urine will be drawn off by the catheter.

TREATMENT.—

After labour, or miscarriage, patients should not lie on their backs for any length of time. Before the doctor finishes his

attendance he should make a vaginal examination, and if he finds the uterus displaced backwards he should insert a pessary which will keep the uterus, more or less, in its normal position. After a few months, when the uterine muscle has become firm, the pessary can be removed and the patient is cured.

Such an examination is, unfortunately, not always made, and if the displacement is discovered accidentally, that is in the course of an examination for some complaint which has nothing to do with the retroversion, treatment is not required, as also in the case of congenital displacements. If it should be treated the displacement is giving rise to symptoms. If the displacement is not due to a tumour, or pelvic inflammation, and a pessary will give relief, the patient may be satisfied therewith. An alternative treatment is an operation for shortening the round ligaments, by which means the uterus will be pulled forwards and fixed in its normal position.

In the case of a retroverted gravid uterus, the doctor will replace it and insert a pessary, which the patient will wear till the 5th month, that is until it is impossible for the uterus again to fall back and become incarcerated.

If the gravid uterus is incarcerated, the doctor will endeavour to replace it and then insert a ring pessary. If this fails to correct the position of the uterus he will leave the pessary, *in situ*, because it has been found that its continuous pressure will, in nearly every case, in due course rectify the malposition. Meanwhile retention of urine must be prevented by regular catheterization under the strictest aseptic precautions.

If manipulation or the pessary fails the doctor will decide whether to empty the uterus or rectify the malposition by an abdominal operation.

NURSING.—

The nurse should advise a woman who has had a child or a miscarriage, and who complains of menorrhagia, discharge and backache, to consult a doctor. The nurse may also have the opportunity of giving advice if the patient has had a pessary inserted. It is not difficult for a nurse to diagnose the distension of the bladder in a case of incarceration of the

retroverted gravid uterus, and the passage of a cathether will not only relieve the patient, but will also confirm the suspicion of the nurse as to the nature of the complication.

Prolapse of the Uterus.

CAUSES.—

Injury to the pelvic floor.
Increased intra-abdominal pressure.
Ill-health.
Congenital.

Injury to the Pelvic Floor.—By far the commonest cause of prolapse of the uterus is stretching or laceration of the levatores ani muscles and of the transverse cervical ligaments during childbirth. If the uterus does not involute properly it is heavier, and this is an additional factor in the displacement, as is the fact that the other ligaments have been lengthened during pregnancy. The uterus cannot fall through the opening in the pelvic floor in which it is inserted without dragging with it the walls of the vagina and the bladder, the base of which is attached to the anterior vaginal wall. It is obvious that there must be various degrees of prolapse of the uterus according to the distance it has sunk. If the condition remains untreated it may be only a matter of time before the whole of the uterus is outside the vulval orifice dragging with it the walls of the vagina which are thus inverted. Such a complete prolapse is called *procidentia*.

Increased Abdominal Pressure.—The weight of a tumour, the repeated and violent effects of coughing in chronic bronchitis, strenuous work of a bearing-down character, or the accumulation of fluid in the abdomen may force the uterus downwards by causing it to stretch the hole in the pelvic floor. These are rare causes.

Ill-health.—Another rare cause is chronic ill-health of the individual increased by under-feeding and hard work, in which case the uterine supports become loose and allow the uterus to sink.

Congenital.—Found in young women who have never been pregnant, and whose health otherwise appears satisfactory. Very rare.

SYMPTOMS AND SIGNS.—

These depend a good deal on the cause.   It is only necessary here to discuss those of the commonest variety due to injury of the pelvic floor.   Such women will complain of backache, some trouble with micturition, the feeling of a lump at the vaginal orifice, which may be a cause of discomfort on walking or sitting down.   If there is subinvolution in addition there may be menorrhagia and a discharge.   In cases of procidentia the inverted vaginal walls and the cervix may be injured by friction against the clothes, the ulceration therefrom causing a blood-stained discharge.   Micturition may be frequent, due to irritation of the mucous membrane of the bladder by urine which cannot escape because of a cystocele.   If the cystocele is very marked the woman may be unable to empty her bladder without, as she states, " pressing up the lump."

The signs depend on the severity of the prolapse.   At first a swelling will be noticed protruding through the vaginal orifice, especially when the patient strains.   This swelling is either the anterior or posterior vaginal wall or both, dragging with them part of the bladder and rectal walls.   When the condition is more advanced the neck of the uterus can be identified outside the vulva and on it, and on the vaginal walls, there may be ulcers.

TREATMENT.—

In many patients some form of pessary will suffice to keep the uterus and vaginal walls in position.   Many women refuse to put up with the trouble associated with the wearing of a pessary, or it fails in its object, and a plastic operation (in such cases anterior and posterior colporrhaphy and suspension of the uterus) is necessary.   In all except old women, or in women who are suffering from some disease, or condition, making an operation inadvisable, this is the best treatment.

Anteversion.

Anteversion is only of consequence during pregnancy and labour.   If the abdominal walls are lax, due to a former pregnancy, the gravid uterus may fall forwards so that the head of the child at the commencement of labour is deflected too far back and will not enter the brim of the pelvis.   Such

anteversion may also happen if the brim of the pelvis is contracted.

SYMPTOMS AND SIGNS.—

Abnormal anteversion of the pregnant uterus gives rise to a good deal of discomfort.

TREATMENT.—

A doctor will examine the patient with a view to ascertaining whether there is a contraction of the pelvis and, apart from the appropriate treatment required in such a case, will order an abdominal belt to be worn to prevent the uterus falling forwards.

Inversion.

Inversion of the uterus is extremely rare, and but few doctors, or nurses, ever see this complication.

The subject is mentioned here only because a doctor, or midwife, may not have been in attendance on the patient, and being an extreme emergency a nurse may be the first person summoned.

CAUSES.—

Acute inversion.   Childbirth.
Chronic inversion.   Tumours.

Childbirth.—The commonest cause is the mismanagement of labour, the attendant pulling on the umbilical cord to deliver the placenta, or pressing on the uterus *per* abdomen during the interval of a pain in the 3rd stage of labour.

Rarely the fundus of the uterus may be so pushed upon, if the woman sits up to defæcate or micturate just after labour, that inversion results if the pressure has been applied when the uterus was not contracting.

Tumour.—Rarely a fibroid tumour, or cancer, situated at the fundus of the uterus will cause the latter to dimple and give rise to a certain amount of inversion.

SYMPTOMS AND SIGNS.—

In most cases of acute inversion the woman is seized with great pain and severe bleeding. If the whole of the uterus is turned inside out, a red bleeding lump will be seen pro-

truding through the vulval orifice with the placenta attached
to it or not, as the case may be, and the uterus cannot be felt
on abdominal examination.   If the inversion is incomplete
a swelling will be found on vaginal examination.

Most cases are generally fatal ; rarely when the inversion
is incomplete it does not give rise to any alarming symptoms,
and escaping notice becomes chronic.

The symptoms of chronic inversion of the uterus are those
of bleeding, discharge, and pelvic pain, which a woman may
tolerate for a year or more before seeking advice.

TREATMENT.—

Authorities differ as to the best course of treatment in these
cases ; except that the patient should at once be given an
injection of morphia grain $\frac{1}{4}$.   On the one hand it is con-
tended that if the bleeding is not serious the shock alone
should be treated, and if the nurse has not been trained in
midwifery, and even if she has, she must be satisfied with
treating the shock and await the arrival of the doctor.   On
the other hand there are some who contend that the mis-
placement should be rectified since the shock will continue
till this is accomplished.

If the bleeding is alarming the nurse might do her best
to replace the uterus, and if she failed none could blame her.
This she does by taking hold of the uterus with a gloved hand,
squeezing the blood out of it, and then gently pushing it
back, the highest part first, namely that which came down
last, being put back first, and so on.   If successful ergo-
metrine or other extract of ergot should be administered if
available to encourage the uterus to retract.

In the chronic variety, due to childbirth, the doctor will
probably be able to replace the uterus with the aid of an
Aveling's repositor.   This is a painful process, and the
patient will have to be kept under the influence of morphia.
Failing this some operative procedure will be necessary.

USE OF PESSARIES.

The modern treatment for displacement of the uterus and
vagina inclines less and less to the use of pessaries.   Young
women, knowing that they can be cured by operation, wisely

select this method of treatment, rather than put up with the inconvenience and expense associated with the use of such instruments, and refuse to retain their disability. In a certain number of patients, pessaries fail to correct the misplacement, or cannot be retained in the vagina. In others a pessary cannot be tolerated because its presence causes a septic discharge and at times ulceration. It has been contended that pessaries should be burnt or put in museums. This, however, is absurd, since pessaries may not only relieve the patient in many cases, but their use is particularly indicated when the age, or state of health, of the patient contra-indicates an operation.

Pessaries are used to prop up the uterus and vaginal walls and ovaries when they are prolapsed, and to keep a backwardly displaced uterus in the normal position.

Prolapse of the Uterus and Vaginal Walls.—The pessaries used for these conditions are known as the ring pessary and Napier's cup and stem pessary. The ring pessary consists of several watch springs bound together and covered with india-rubber. Ring pessaries vary in size and the doctor decides which to use by experience. There should be just room for the tip of the index finger between the front of the pessary and the back of the symphysis pubis when the ring is in position.

In many cases such an instrument is sufficient to give relief and the patient is satisfied. If, however, the perineal body is deficient a ring pessary may slip out on defæcation or micturition. The ring pessary is also used with much success in cases of retroverted gravid uterus when the doctor cannot replace this organ manually. When the perineum is deficient, and in elderly women, or in women in a bad state of health, in whom an operation is contra-indicated, if a ring pessary will not stay in position, a Napier's india-rubber cup and stem pessary acts very well. The disadvantage of this instrument is that it necessitates the use of a waistband, between which and the stem of the pessary are attached four pieces of india-rubber and tape, these by their tension keeping the pessary in position. Moreover, a Napier's pessary has to be removed every night and reinserted every morning. The patient lies on her back and pushes up the prolapse before inserting the cup and stem.

Prolapse of the Vaginal Walls—Cystocele, Rectocele.—This misplacement can easily be cured by operation. If a patient refuses to have an operation a ring pessary will generally afford some relief.

Prolapsed Ovaries.—The ovaries may be prolapsed, with or without displacement of the uterus, and will then rest in the pouch of Douglas. If the uterus is displaced backwards the ovaries may be nipped between the back of the uterus and the posterior vaginal wall. In some women such a position does not cause any trouble, others complain bitterly of a dragging pain, of dyspareunia, or of pain in the left side when the bowels act, due to pressure against the ovary on the passage of the scybala through the rectum. Such misplacements can easily be remedied by an operation, but, apart from this, the insertion of a ring pessary will result in the ovaries being better supported, and many patients are satisfied with the relief thus obtained.

Backward Displacement of the Uterus.—Such a displacement discovered during a routine examination of the patient, and not causing any symptoms, does not require any treatment, operative or instrumental. Backward displacement can be cured by operation, and if the symptoms can with certainty be attributed to the displacement an operation is justified. If, however, the patient does not wish for such treatment, a pessary may, and often does, relieve her. There are two varieties of pessaries used for backward displacement, a ring and a Hodge pessary, the choice depending upon the particular variety of displacement and the relief obtained.

If the uterus is retroverted only, a Hodge pessary will tilt the body forward by stretching the vagina and so pulling back the cervix.

If the uterus is retroflexed only, it shows that the muscle at the junction of its body and neck is soft. In such a case, a Hodge pessary is contra-indicated, since when the neck is dragged back, the body does not tilt forwards and the condition is made worse. All that can be done, in such circumstances, apart from an operation, is to insert a ring pessary which, by holding up the uterus, relieves to some extent the congestion, and the symptoms being improved the patient is satisfied.

If, as is generally the case, the displacement is a combination of retroversion and retroflexion, it shows that softening is present. In some cases this softening is not sufficient to prevent the body being tilted forward by a pessary, in other cases it is. In the first place a Hodge pessary may give relief, in the second a ring pessary will have to be used. The suitable pattern can be ascertained only by trying each variety of pessary and ascertaining which gives the most relief.

THE CARE OF PESSARIES.

Every woman who has had a ring or Hodge pessary inserted into her vagina should be warned that she must use an antiseptic douche daily, and go to a doctor every 3 months to
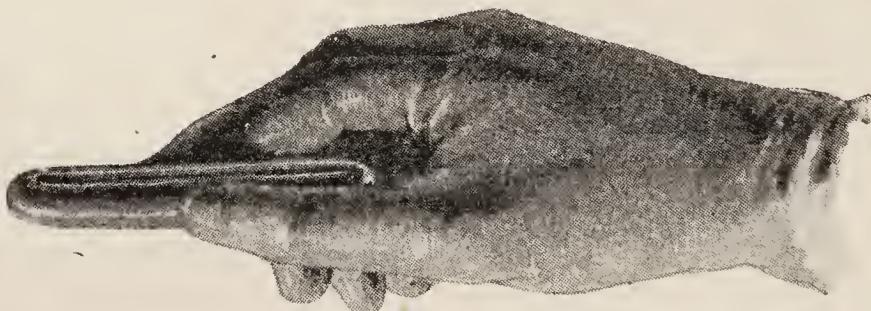
FIG. 18.—Method of holding the pessary before insertion. It is squeezed between the index finger and thumb.

have the pessary taken out, cleansed and replaced or changed. If this is not done the secretions of the uterus and vagina will collect round the pessary and, becoming infected, will cause inflammation of the vagina resulting in a discharge of an offensive nature. Moreover, if a pessary is left too long in the vagina without such attention it may cause ulceration of the vaginal walls, which ulceration may extend into the bladder or rectum. The care of a Napier's pessary has already been described. If a pessary is fitting properly the woman should not be aware of its presence. If, therefore, a woman complains that her pessary is hurting her, the nurse should advise her at once to consult her doctor. Sometimes the pain or discomfort is due to pressure, which may lead to ulceration, or the back part of the pessary may be nipping an ovary.

If a woman is wearing a pessary and becomes pregnant, she should have it removed by a doctor during the 5th month, by

FIG. 19.—Inserting the pessary through the vulval orifice.
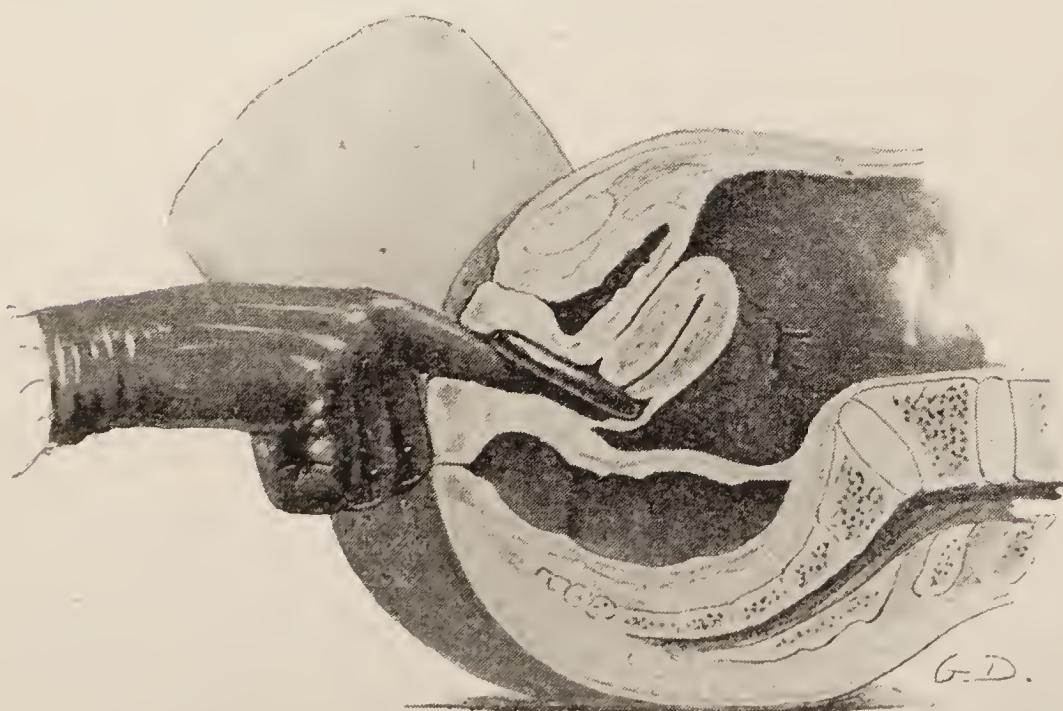
FIG. 20.—Carrying the distal part of the pessary back behind the cervix after the pessary has been inserted into the vagina.

which time there will not be any danger of the uterus falling back and becoming incarcerated.

There are many shapes of pessary, but the three mentioned are those most frequently employed : they are sterilized by insertion in boiling water, or by immersion in an antiseptic.

Insertion of a Pessary (see Figs. 18-21).—It is the duty of the doctor to insert a pessary, and it can be on rare occasions only that a nurse is called upon to do so. There may, how-
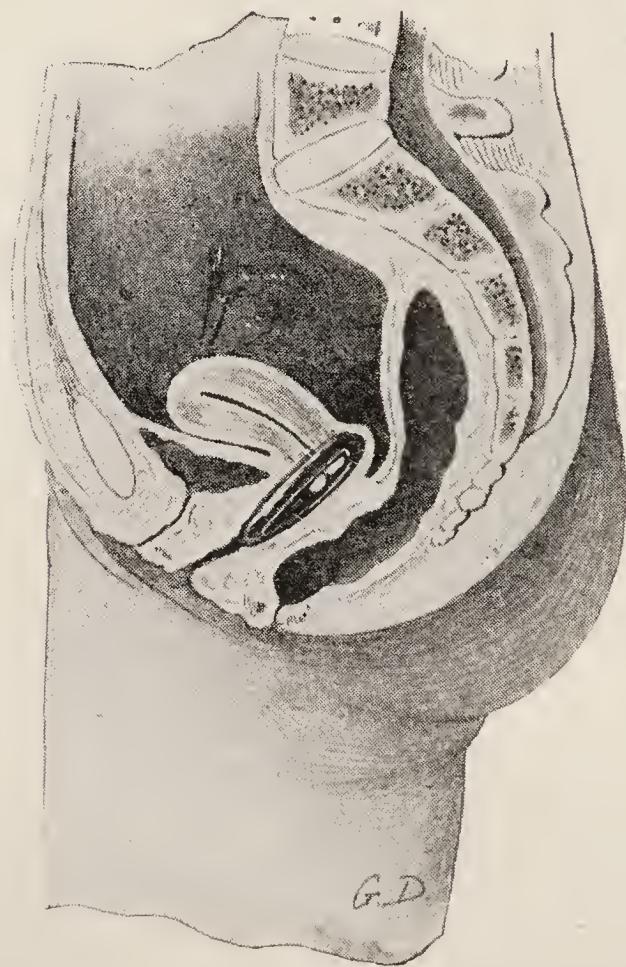
FIG. 21.—The pessary in the correct position, the woman standing up.

ever, be occasions on which it is necessary for a patient to have her pessary changed and she is unable to secure the services of a medical man. Even then the services of the nurse must be limited to the extraction and insertion of a ring pessary, since for the proper insertion of a Hodge pessary the uterus has first to be replaced in its normal position, a procedure which a nurse cannot be expected to accomplish, and which, indeed, she should not essay.

The method of inserting a ring pessary can be taught practically much better in a few minutes than by any description, and nurses attending the gynæcological out-patient department, and who intend to practise as district nurses, would do well to ask the doctor to show them the proper method and allow them to repeat it. The patient should be lying in the left lateral position with the right leg well drawn up. The ring, having been inserted in boiling water for a few minutes to soften the rubber and sterilize its surface, is pinched by the thumb and index finger of the right hand till it is compressed into an ellipse. With the left hand separating the labia the pessary is introduced through the vulval orifice, one end of the ellipse being directed towards the apex of the pelvic arch and the other edge towards the perineum. When most of the pessary has been inserted into the vagina the ring is allowed to expand with the result that the whole of the pessary disappears. The forefinger is then passed into the vagina and the pessary is turned round so that its circumference now rests against the sides of the vagina. Lastly, the back of the ring pessary is hooked behind the cervix so that it is resting in the posterior vaginal fornix, the cervix now being surrounded by the ring. Many patients learn to remove and replace their ring pessaries.

5

CHAPTER XV.

INFECTION OF THE FEMALE GENITAL TRACT.

THE channels of infection are two, namely the vulva, vagina, uterus, Fallopian tubes, and the bowel.

Genital Tract.—The genital tract of a female differs from that of a male in that, in the former, one end of its passage opens into the peritoneal cavity through the ampullary openings of the Fallopian tubes, and the other end terminates at the vulval opening. Thus the results of infection of the genital tract in a female are apt to be far more serious in women than in men.

Infection of the genital tract is responsible for more suffering and disablement, and the loss of more lives than any other disease of a gynæcological nature. It is the most frequent cause of sterility in women.

The infection may spread along the mucous membrane lining the genital canal, or *via* the lymphatics, when the following diseases may result (Fig. 22) :—

Vulvitis.	Pelvic cellulitis.
Bartholinian abscess.	Pelvic peritonitis.
Vaginitis.	General peritonitis.
Endometritis.	Syphilis.
Salpingitis.	Gonorrhœa.
Ovaritis and ovarian abscess.	

The inflammation, although it very often does so, need not necessarily start at the vulva or vagina. It may start in the uterus, as in the case of puerperal sepsis, when the placental site, or some uterine laceration, becomes infected by bacteria spreading from the vagina or vulva.

The Bowel.—An inflamed appendix may infect the right Fallopian tube. As the result of infection *via* the bowel
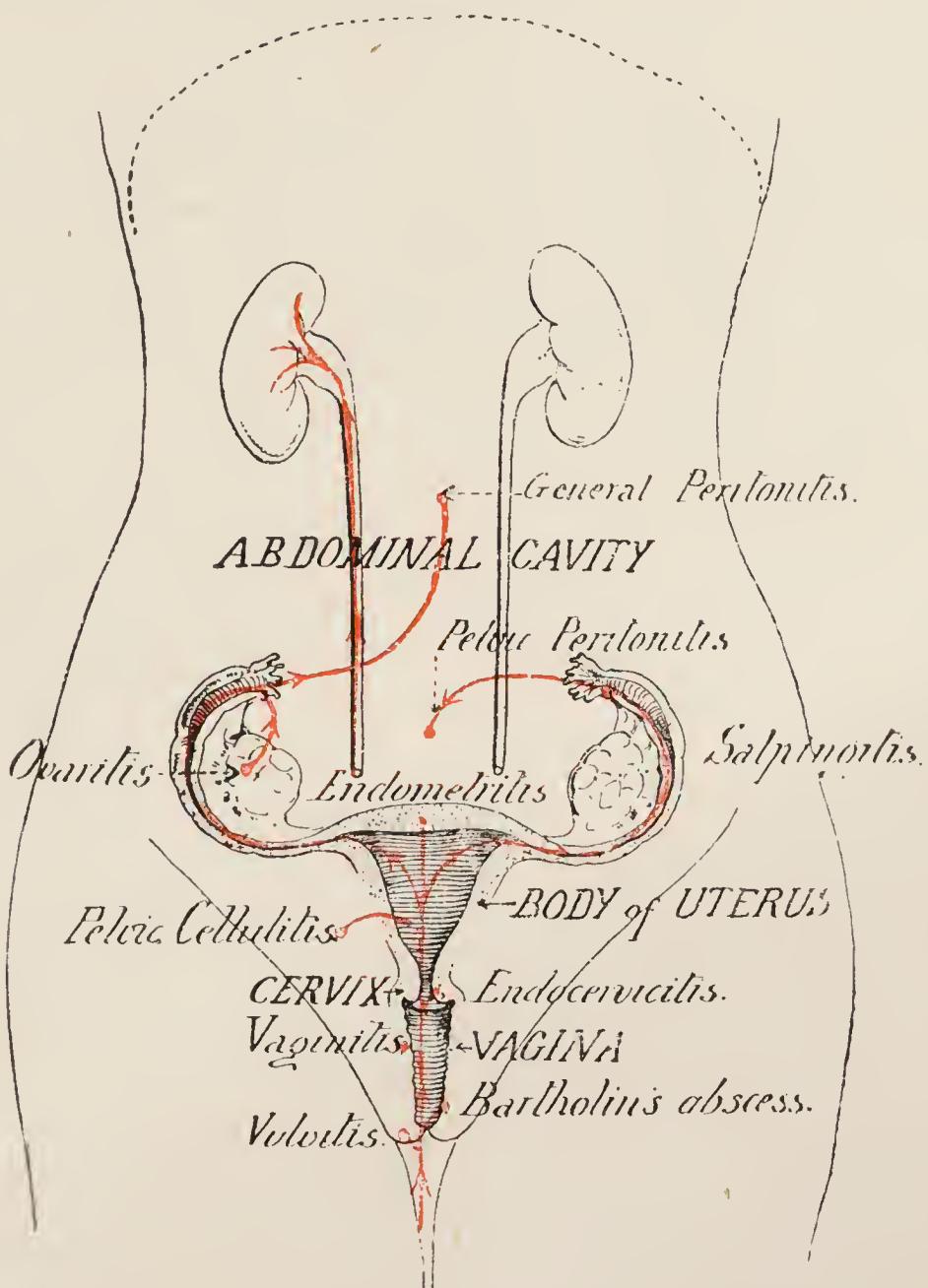
FIG. 22.—Diagram showing the path of infection from the vulva to the peritoneal cavity, and the various diseases that may result.   The ureters are cut short, and the kidneys are depicted showing the path of infection that may result from an attack of cystitis, causing ureteritis, pyelitis and pyo-nephritis.

the rectum may become adherent to the back of the uterus ; a coil of intestine may become adherent to a fibroid tumour of the uterus, or to an ovarian cyst.

Vulvitis.

Vulvitis may be acute or chronic.

CAUSE.—

The common cause of acute vulvitis is gonorrhœa. There are other causes such as streptococcal infection, diphtheria, thrush, and the acute specific fevers, but all these, in comparison, are somewhat rare. Chronic vulvitis may be a sequel to the acute variety ; other and commoner causes are those of a very acid or diabetic urine, irritating vaginal discharges, and uncleanliness.

SYMPTOMS AND SIGNS.—

A patient suffering from acute vulvitis complains of great pain on walking or sitting, and may be unable to do either. The labia are very swollen, perhaps more on one side than the other, owing to the presence of a Bartholin's abscess, and painful micturition may be complained of owing to an associated urethritis. There is a profuse purulent discharge. The inguinal glands become swollen and painful. The vulvitis of diphtheria and thrush is characterized by the presence of a membrane on the vulva, and that of the acute specific fevers by gangrene (*noma pudendi*). In chronic vulvitis the surfaces of the vulva are red and often eczematous, due to the fact that the patient is impelled to scratch the parts because of the intense irritation.

TREATMENT.—

The patient will be ordered the appropriate treatment according to the cause ; in addition hot sitz baths may be ordered. Douching is not prescribed owing to the certainty that some of the microbes will be carried into the vagina and perhaps, therefore, infect the rest of the genital tract. In chronic vulvitis due to irritating discharges, constant changing of the pads, extreme cleanliness and the application of an ointment, such as equal parts of zinc ointment and castor oil, will be found very beneficial.

VAGINITIS.

Vaginitis may be acute or chronic.

CAUSE.—

Acute.—Gonorrhœal or streptococcal infection most commonly, especially in pregnant women, and children and in the latter at times associated with an acute specific fever. Injury due to the antiseptic being too strong or the heat too great in a vaginal douche, syphilitic, tubercular and malignant ulceration, a neglected pessary, and Trichomonas vaginalis are other causes.

Chronic.—A later stage of some of the above causes.

Senile vaginitis.

SYMPTOMS AND SIGNS.—

Feeling of heat and pain in the vagina.

A purulent discharge which may be offensive.

The colour of the lining of the vagina is much redder than normal.

There are some marked differences in the symptoms and signs between a simple and gonorrhœal vaginitis, and from these alone a very shrewd idea may be gathered as to the cause (see p. 148).

Gonorrhœal infection is the most serious condition. Unless efficiently treated, it is dangerous because it may spread up through the uterus into the Fallopian tubes, thence to the peritoneum, and so cause death from general peritonitis—this is rare. More commonly in such cases the inflammation stops at the Fallopian tubes, the salpingitis perhaps terminating in a pyosalpinx. In fact, after sepsis following labour or abortion, gonorrhœa is by far the commonest cause of salpingitis and its attendant ills, especially sterility.

TREATMENT.—

Acute.—The doctor will probably order douches of permanganate of potash, preceded by a douche of bicarbonate of soda 2 drachms to a quart of sterilized water.

Chronic.—Persistent douches and local applications will be required. The best douche is one of a drachm of sodium chloride to a pint of water after which the doctor will order

a medicated pessary of ichthyol, resorcin, iodine or some other chemical, to be inserted into the vagina every night.   Other methods of treatment are to paint the vaginal walls three times a week with nitrate of silver solution 10 to 20 grains to the ounce or 2 to 4 per cent. of mercurochrome.

Trichomonas Vaginalis (a protozoon) is a cause of vaginitis so frequently overlooked, especially in cases of chronic vaginitis.   There is a thin, irritating discharge associated with pruritus vulvæ and dyspareunia.   There may be a foaming white or purulent discharge.   The vaginal lining has a granular appearance due to the presence of hard red nodules.   The diagnosis is made by finding the organism in the discharge. It is stated that a high percentage of vaginitis in virgins is due to this protozoon, and that such infection may be commonly acquired in bathing pools.   It is difficult to cure.

Treatment.—

Tablets of Devegan or Stovarsol are inserted into the vaginal fornices, 2 every day for the 1st week, and then one daily.   The remains of the tablets are washed away by a vaginal douche of bicarbonate of soda.   Another method is by insufflation of silver picrate.

The condition is rather difficult to cure, and even after an apparent cure the organisms may be present, so that repeated examination for the trichomonads is necessary before a cure can be substantiated.

ENDOMETRITIS.

Cause.—

As a rule the infection is due to the streptococcus hæmolyticus, the result of puerperal sepsis.   Other infecting organisms may be the gonococcus or staphylococcus, and the infection may follow curettage or the application of radium.

Symptoms and Signs.—

In the acute puerperal variety the symptoms are of great severity.   The temperature rises rapidly and there may be a rigor accompanying it.   The pulse-rate is quick, and the patient is very ill and complains of abdominal pain.   There is

a purulent discharge, which is very irritating in character, and the uterus is enlarged and tender. The further symptoms depend upon the progress of the case. The infection may remain localized or spread to the cellular tissue or peritoneum, and septicæmia or thrombo-phlebitis may result.

TREATMENT.—

The treatment of acute endometritis will depend partly on the nature of the infecting organism. In cases of puerperal toxæmia the doctor may order an injection of sterilized glycerine into the uterus. Intra-uterine douches are contra-indicated.

CHRONIC METRITIS.

In 95 per cent. of cases chronic metritis is due to infection following labour or abortion. In 5 per cent. of cases the patients are virgins or nulliparous, and in these there is not any indication that the cause was bacterial. Apart from infection, it is a rare disease.

SYMPTOMS AND SIGNS.—

Dysmenorrhœa and excessive menstrual hæmorrhage are the most striking symptoms, and the uterus is enlarged and there is a purulent discharge.

TREATMENT.—

The doctor will treat the cause, and by appropriate investigation will ascertain whether the symptoms are not due to metropathia hæmorrhagica which is more often the cause of the symptoms than was formerly recognized.

CHRONIC ENDOCERVICITIS.

Cervical Erosion.

CAUSE.—

It would appear that these conditions are generally the result of hormonal imbalance, there being too great a secretion of œstrone and not sufficient progesterone to counteract it. This would account for a congenital erosion or one in a virgin. They may also be due to gonorrhœal infection or puerperal sepsis.

Symptoms and Signs.—

The patient will complain of a leucorrhœal discharge which in cases of infection may be muco-purulent. The erosion appears as a red patch in the neighbourhood of the external os. It is most important not to confuse an early carcinoma of the cervix with an erosion, especially if on palpation the erosion bleeds.

Treatment.—

Erosions are treated by cauterization.

SUBINVOLUTION.

Cause.—

The chief cause is deficient uterine contraction and retraction after labour or miscarriage, due to the retention of portions of the placenta, chorion or blood-clot, or to the presence of a fibroid in the uterus. Backward displacement of the puerperal uterus is also a cause.

Symptoms and Signs.—

Excessive menstrual loss, backache and a leucorrhœal discharge. The uterus being larger there is a greater surface of endometrium to bleed and discharge.

Treatment.—

The doctor will probably prescribe some preparation of ergot and calcium lactate. If this drug treatment fails he will curette the uterus. Curettage of the body of the uterus for most conditions associated with hæmorrhage and discharge is quite useless and often harmful. If there is one condition in which it is of use, it is that of subinvolution of the uterus.

SENILE ENDOMETRITIS.

Cause.—

Bacterial infection in women after the menopause.

Symptoms and Signs.—

A purulent, blood-stained, offensive discharge. Some pelvic pain is generally complained of. The pus at times collects

in the uterus, thus forming a pyometra, when the patient will have toxæmic symptoms in addition.

TREATMENT.—

The pus having been evacuated the uterus is drained after the application of glycerine. Failing such measures the uterus is removed. The administration of œstrin is advocated. *Before treating such a case the doctor will make sure by curettage that cancer is not present.*

HÆMATOMETRA.

A condition in which the uterus is distended with blood. This may be due to the whole vagina, or part of it or to the cervical canal, being absent from a congenital cause, or the cervical canal may be closed by adhesions. In these circumstances the menstrual blood collects in the uterus. The cervical canal may also be obstructed by cancer.

PYOMETRA.

A condition in which the uterus is distended with pus, the cervical canal being closed by cancer or inflammation. Pyometra may also be due to cancer of the uterus or senile endometritis without the cervical canal being closed. The patient has an intermittent and most offensive discharge and symptoms of septic absorption are at times present.

SALPINGITIS.

Of the serious diseases peculiar to women infection of the Fallopian tubes is the most common. In such cases the ovaries are almost always involved, and in them the inflammation may go on to pus-formation so that an ovarian abscess results. If the abscess in the ovary communicates with the Fallopian tube, as it most often does, the condition is termed a tubo-ovarian abscess.

CAUSE.—

Sepsis following labour, abortion, or gonorrhœa, when the infection spreads through the vagina and uterus. The

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tubes may then become merely inflamed (salpingitis) or their abdominal opening may become closed and pus collect (pyosalpinx). The use of infected instruments (sounds, dilators); sloughing fibroids; cancer of the uterus; tubercle. The large majority of cases of salpingitis are due to the first two causes. The tubes may also become infected from the intestinal canal including the appendix.

Salpingitis is much commoner among the poor than the rich, in fact, it is a comparatively rare disease among the well-to-do, the reason being obvious.

The inflammation often spreads from the Fallopian tubes to the surrounding structures and, rarely, acute general peritonitis may supervene with a fatal result.

More commonly the intestine, ovaries, Fallopian tubes and uterus become bound together and fixed by adhesions due to local peritonitis and, because of these adhesions, the removal of the diseased structures, later on, may be very dangerous and difficult.

SYMPTOMS AND SIGNS.—

The symptoms depend mostly on whether the condition is acute or chronic.

Acute.—The onset is sudden, the temperature rises to a high degree (103° F. or more), the illness may be ushered in by a rigor, and the patient complains of severe abdominal pain and perhaps painful micturition. The abdomen is distended and very tender. The abdominal symptoms are due to the infection spreading from the Fallopian tube to the peritoneum before its fimbriated end is sealed by the inflammation.

Chronic.—The chronic cases are much the commoner. In these the inflammation gradually spreads through the walls of the Fallopian tubes, their abdominal openings having been closed. The patient complains of menorrhagia, metrorrhagia, dysmenorrhœa, leucorrhœa, painful defæcation, dyspareunia and perhaps a frequency of micturition. Salpingitis is a very common cause of sterility or of one child sterility. It is for this reason that prostitutes so seldom become pregnant.

A usual history in cases of chronic salpingitis, especially when there is pus present, is that the patient has for years been

living the life of a semi-invalid, and hardly, if ever, feels quite well, is unable to do much work, and any extra exertion is likely to bring on what she calls an attack of " inflammation of the bowels," for which she has to go to bed for a few days. These attacks, which gradually increase in frequency, are due to the fact that microbes have escaped from the Fallopian tube and are setting up fresh inflammation.

A pyosalpinx may rupture into the abdominal cavity and cause general peritonitis, or it may rupture into the rectum, bladder, or vagina, giving rise to great misery.
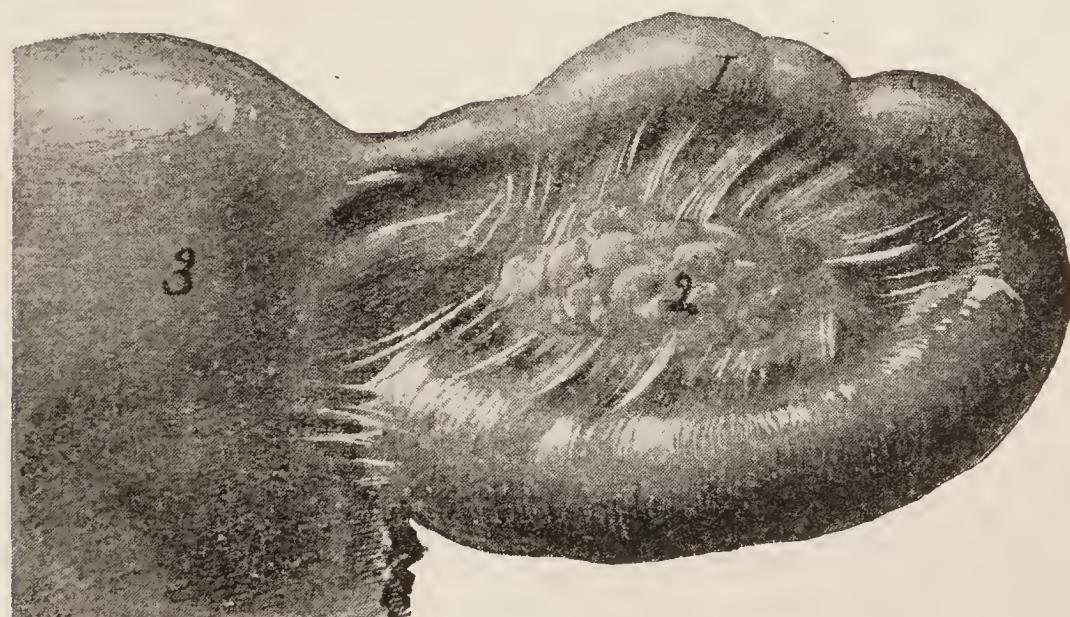
FIG. 23.—SALPINGITIS.

1. Fallopian tube distended and matted to the ovary and uterus by adhesions ; 2. Ovary ; 3. Uterus.

TREATMENT.—

A specimen is taken from the cervix to ascertain the responsible micro-organism, so that the correct preparation of sulphonamide can be given. It is usual to treat salpingitis palliatively until the acute stage has passed, since the peritonitis is limited to the pelvis by adhesions. The patient is kept in the Fowler's position, hot fomentations are applied to the abdomen and hot vaginal douches are given.

If, however, general peritonitis supervenes, the diseased Fallopian tubes must be removed ; also if the diagnosis between appendicitis and salpingitis is uncertain, laparotomy must be performed.

There are still some authorities who contend that all cases of salpingitis should be treated by laparotomy. It is contended, however, that the disadvantages which may be associated with this operation, such as the leakage of pus into the abdominal cavity, or the removal, perhaps, of ovaries which might have been saved, are a real contra-indication.

GENERAL PERITONITIS.

For the description of this condition, which may be due to the same causes as those mentioned under pelvic peritonitis, the reader is referred to page 346.

PELVIC PERITONITIS.

Inflammation of the peritoneum which lines the pelvic cavity and covers the organs contained therein.

CAUSE.—

Direct extension from below along the genital canal, the commonest causes of which are septic infection following labour, abortion, gonorrhœa, or the curetting of an infected uterus. Direct infection from a diseased appendix or Fallopian tube. Other rarer causes are sloughing fibroids and cancer.

SYMPTOMS AND SIGNS.—

In the acute stage the patient has severe abdominal pain, and is unable to bear the weight of the bedclothes. She has the symptoms and signs of fever, and often complains of great pain on micturition, due to the movement of the inflamed peritoneum covering the bladder.

The abdomen is distended, rigid, and tender. The breathing is thoracic, and the patient lies with her legs drawn up.

RESULTS.—

1. The disease may end in absorption of the inflammatory products, and complete recovery.

2. An abscess may form, and after a severe illness, unless properly treated by operative measures, the pus escapes by ulceration into the bowel, bladder, or vagina. More rarely, the patient dies.

3. The inflammatory products may become organized into fibrous tissue (adhesions), which bind together the pelvic viscera, and cause trouble for years after. A common termination.

TREATMENT.—

Hot douches, abdominal fomentations, and drugs to relieve the pain and regulate the temperature are prescribed before suppuration occurs.

When an abscess forms it has to be opened. With the knowledge that pelvic peritonitis is generally due to appendicitis or salpingitis, many surgeons operate forthwith.

PELVIC CELLULITIS.

CAUSE.—

Infection of the cellular tissue of the pelvis due most commonly to the streptococcus through some wound caused during labour, generally a lacerated cervix.

It may rarely follow dilatation of the cervix, curetting or an operation involving the broad ligament.

SYMPTOMS AND SIGNS.—

Similar to those of pelvic peritonitis, but in an average case they are not so severe. Moreover, the tenderness and abdominal pain is much more local, occurring on one or other side just above the groin, and it is in this situation in cases following labour that a hard swelling appears.

RESULTS.—

1. The disease may end in absorption when the patient recovers without any bad symptoms.

2. In at least half the cases an abscess results, which, if not opened through the abdominal wall, bursts after about 2 months, as a rule, just above the groin, in which case the patient will not be well for 4 or 5 months.

3. Organization may result when the inflamed tissue becomes fibrous, and fixing the uterus may cause trouble for years after.

TREATMENT.—

As for pelvic peritonitis.

CHAPTER XVI.

SYPHILIS.

SYPHILIS may be acquired, hereditary or congenital. The following description deals only with the acquired variety.

It was estimated by the Royal Commission on Venereal Diseases that not less than 10 per cent. of the whole population was infected with syphilis, and that 17 per cent. of the insane persons, 34 per cent. of people blind from birth, and 25 per cent. of persons deaf from birth, owed their affliction to syphilis.

The effect on the child depends when the mother was infected. Thus, if the mother is infected before pregnancy, abortion or premature labour is common. In premature labour the child is often dead. If the child is born at term although it may not show any signs of syphilis, later these may become manifest. With adequate treatment, however, before pregnancy, the child as a rule escapes. A vast number of deaths occur in adults from diseases mentioned under Tertiary Syphilis.

CAUSE.—

Syphilis is due to infection by a spirochate, the *treponema pallidum*. The infection may be direct or indirect. If the organism is implanted in any part of the body of a healthy person where there is an abrasion, by actual contact with a person suffering from syphilis, the infection is direct.

A person may be indirectly infected by using cups, spoons, forks, sponges, towels or other articles before they have been sterilized which have been used by an infected person.

COURSE.—

When left untreated, or inefficiently treated, syphilis passes through three stages, known as primary, secondary, and tertiary. Primary and secondary syphilis are infectious, tertiary not. Between the time of infection and the appearance of the tertiary signs, there are three intervals of time,

during which the patient may be unaware that he or she has the disease.

FIRST INTERVAL.—

Between the date of infection and the appearance of the primary lesion. This is called the incubation period lasting from 3 to 6 weeks.

SECOND INTERVAL.—

Between the development of the primary lesion and the appearance of the secondary lesions. During this period, which averages 4 to 8 weeks, the disease is becoming disseminated through the system.

THIRD INTERVAL.—

Between the disappearance of the secondary lesions to the appearance of the tertiary. During this interval, which varies from about 3 to many years, the disease has become chronic.

Primary Syphilis.

SYMPTOMS AND SIGNS.—

The first symptom generally noted is irritation at the site of infection. As a rule there is no pain or inflammation at this site.

SIGNS.—

At the site of infection a small, round, copper-coloured raised papule appears, called a hard chancre. There is marked hardening of the tissues around it, or induration as it is termed, which feels, when palpated between the finger and thumb, like a small button inserted just below the surface of the skin.

This papule then breaks down into a small ulcer which has a greyish base and raised edges, so that it is funnel shaped. The discharge from the ulcer is thin unless it has been infected with septic bacteria, when it is purulent.

In the female the chancre most commonly appears on the labia, and then on the cervix and vagina; nevertheless, a hard chancre may be found on any part of the body where there is a crack and the treponema has gained entrance.

Thus it may be found on the lip of an innocent person who has been kissed by an infected person, or has used some article which has been infected; or upon the finger of a doctor or nurse who has not taken proper precautions when examining or nursing a patient suffering from this disease.

In 8 or 9 days the lymphatic glands which drain the site of the primary infection become enlarged.

The primary sore in a woman, however, often escapes detection because it frequently disappears without its presence having been noticed, and when situated on the labia, vagina or cervix, it more often than not fails to present the typical features of a hard chancre, the base not being indurated. Genital chancres in the male are, as a rule, single, but chancres in the female may be multiple, due to infection of the opposing surfaces of the vulval labia.

DIAGNOSIS.—

If the secretion from a syphilitic lesion of the primary or secondary stages is examined under the microscope, by dark-ground illumination, treponema pallida can be detected. The diagnosis may also be determined by an examination of the blood-serum, a fortnight after the appearance of the chancre, the test being known as the Wassermann reaction. The Wassermann test is of great value as an aid to diagnosis in the case of women who have had many miscarriages, perhaps, due to syphilis, although they do not show any sign of syphilis.

Secondary Syphilis.

SYMPTOMS AND SIGNS.—

The patient complains of loss of appetite, sore throat, pains in the bones and muscles, and a general feeling of weakness.

The following signs may be, but all of them need not be, present, or they may be so slight that they escape notice. The first sign to appear is a rash of a raw ham colour or a red flush, is most marked on the chest and forearms and lasts only a short time so that its presence may pass unnoticed; it does not itch. At the onset there is fever. The patient is anæmic, her throat is red, and on her tonsils and mucous membrane of the mouth can be seen greyish-white

patches, known as *mucous tubercles*. Similar patches, but rather more raised and moist, may be found in the region of the vulva and anus; these are termed as *condylomata*, and of the secondary manifestations in women condylomata are the most frequent and typical. It is very important to realize that these lesions are most infectious, and patients suffering from secondary syphilis are particularly liable to spread the disease by indirect contagion. The lymphatic glands in various parts of the body become enlarged, those in the neck and above the elbow being most noticeable. The hair falls out and the nails become brittle and may ulcerate. Inflammation of the iris, and of the bones and joints may also occur.

Tertiary Syphilis.

This stage is predisposed to by overwork or alcoholic excess, and is much more likely to ensue when the treatment in the early stages has been neglected or insufficient.

SYMPTOMS AND SIGNS.—

The patient feels very ill, and further symptoms and signs will depend upon the part of the body affected.

Tumours, known as gummata, may appear in any part of the body and lead to the destruction of tissue in their neighbourhood.

Ulceration of the face may occur leading to a frightful disfigurement. The bones may be eaten away.

The heart and large blood-vessels may become involved, and thousands of people who die of heart disease and aneurysm every year owe their death to being infected with syphilis years before, which disease is also the chief cause of paralytic strokes occurring before middle age.

The brain and spinal cord are particularly susceptible to the infection, for instance, locomotor ataxy and general paralysis of the insane. Some 15 per cent. of all male admissions and 2·3 per cent. of all female admissions to mental hospitals are due to general paralysis of the insane. Blindness may be due to syphilis.

Treatment.—

Syphilis can be cured when diagnosed early and adequately treated. The disappearance of the outward evidence of the disease after treatment has begun is not a guarantee that the disease is cured. *Neglect of treatment in these circumstances may be highly dangerous. Treatment should not be stopped until an expert says that it is safe to do so.* It is only by following such advice that the terrible complications mentioned under tertiary syphilis can be avoided.

During treatment the teeth should be cleansed night and morning since treatment may have to be stopped if the mouth is not kept clean. The patient should dress warmly, live simply, and avoid wine, beer and spirits.

If after the treatment has been stopped, rashes on the skin, sore throat, or any other evidence of ill-health appears, a doctor should at once be consulted and informed of the previous treatment. *This is extremely important.*

A person who has had syphilis should not marry unless the Wassermann test is negative; otherwise the disease will probably be conveyed to the wife or husband and any children they may have.

The treatment of syphilis in the primary and secondary stages consists in the injection into the blood, through a vein, of a solution of arsenic compounds, which kills the treponemata. In addition bismuth in some form is given, the progress of the cure being determined and controlled by examination of small quantities of the blood-serum of the patient. The treatment should be carried out by an expert; that prescribed by chemists, herbalists and quacks is not only illegal but has been one of the most fertile causes of the terrible sequelæ of syphilitic infection.

The nurse must always remember the highly contagious nature of syphilis in its primary and secondary stages. She must, therefore, while she is attending a patient afflicted with this disease, wear an overall, and india-rubber gloves which should be boiled before and after use, otherwise if she has the slightest abrasion on her hands or fingers she may become infected. The spoons, forks, knives, glass, crockery, sponges, towels, bed-pans, and other articles used by the patient should all be kept for her separate use, and should never be removed

from the room until they have been boiled, or soaked in a strong disinfectant, for such articles being contaminated may easily be the source of syphilis in others. For a similar reason such an infected patient should not be allowed to kiss any other person until the disease has been cured. It has been stated that in more than half the cases syphilis has been contracted innocently.

GONORRHŒA.

CAUSE.—

Gonorrhœa is due to infection by the gonococcus, either directly by sexual connexion with an infected person, or indirectly by contact with infected towels, bedding, or other articles, or lavatory seats. The incubation period is usually from 6 to 8 days.

SYMPTOMS AND SIGNS.—

As a rule, the disease first affects the cervix, the glands of its mucous membrane facilitating the entry of the gonococcus; the vulva being infected secondarily. In adults the vagina generally escapes, its epithelium being too tough for the gonococcus to penetrate. In an acute case the external genital organs are inflamed, swollen and very tender, so that the patient is unable to walk or sit with any comfort. In addition she will complain of a profuse yellow discharge and of pain on micturition due to infection of the urethra.

The lymphatic glands in the groins, if the skin of the vulva is abraded, are infected by septic organisms and may suppurate.

Such acute cases are not common, and, more especially if the cervix alone is involved, the only indication may be a slight discharge.

RESULT.—

Unless gonorrhœa is treated in its early stage, and efficiently, it becomes chronic. A large number of patients, especially those of the female sex, being unaware of their infection, do not seek medical advice till sometime after they have contracted the disease. Consequently the inflammation may

spread from the vulva or cervix to Bartholin's gland, causing an abscess therein, to the body of the uterus, Fallopian tubes, ovaries, or pelvic peritoneum, and rarely to the general peritoneum, or it may spread, *via* the urethra, to the bladder, ureters, and kidneys.

The blood may become infected with the gonococcus, in which case puerperal sepsis, gonorrhœal rheumatism, septic-æmia, or ulcerative endocarditis may result. If the gonococci infects the mucous membrane of the eyelids, gonorrhœal ophthalmia supervenes, which may destroy the eyesight.

Gonorrhœa is one of the most serious diseases a woman can acquire, since the resulting infection spreading, as it may do, to the Fallopian tubes, ovaries, and pelvic peritoneum, binds them together, forming one mass to which the term salpingo-oophoritis is applied. This complication is a cause of great misery and of more or less disablement, besides being re-sponsible for a large percentage of the major operations of a gynæcological nature performed on females. Gonorrhœa, in females, is harder to cure than syphilis. It is responsible for a large proportion of the total number of cases of sterility in women and in the past of two-thirds of the cases of blindness from birth. The new treatment prevents this.

DIAGNOSIS.—

The disease is diagnosed for certain by the detection of the gonococcus in the discharge. Unless, however, the discharge is examined in an early stage of the disease, the presence of this organism may escape detection. The reason for this is that the gonococcus finds it very difficult to remain for any length of time on the vulval or vaginal tissues owing to the toughness of the epithelium covering these structures. The gonococci are, therefore, soon swept away by the inflamma-tory discharges due to secondary infection by staphylococci or streptococci present though not causing any trouble till the advent of the gonococcus, and the vaginal douches which have most likely been employed before the patient sought advice. The gonococci, however, may remain in the cervical or urethral glands, or in those of Bartholin for a long time, without there being any indication of their presence, in other words the woman becomes a carrier.

Apart from the detection of the gonococcus there are a few points, however, in the history, symptoms, and signs of this disease which are extremely suggestive :—

Thus if the discharge appears suddenly and is profuse, if the inflammation is very acute, if there is pain on micturition, and if the lymphatic glands in the groins are swollen and tender, the infection will almost certainly be of gonorrhœal origin.

TREATMENT.—

Gonorrhœa can be cured by early and skilled treatment. Rest in bed is absolutely necessary in the acute cases, and the patient will be ordered to sit in a hot bath, three or four times a day, for 20 minutes, between which hot fomentations of lead will be applied to the vulva. In addition the doctor will prescribe sulphathiazole. If the vulva is alone infected, douches should not be given, because of the danger of infecting the genital tract higher up. If, however, the cervix or vagina are infected, hot douches containing some mild antiseptic will be prescribed.

In many cases the skin round the vulva becomes sore from the irritation of the discharge, when an application of zinc ointment and castor oil to the surfaces involved will afford relief.

The great danger is that the infection may spread along the genital canal or *via* the urethra to the bladder and kidneys. The measures which will be taken to prevent such an extension will vary according to the advice of the medical attendant.

So long as the woman harbours the bacteria she is liable to convey the disease to others. Since the gonococcus may rest in the cervical glands for a long time, without causing any symptom but a discharge, a swab-specimen should be taken from the cervical canal and repeatedly examined until the disease is stated to be cured.

During treatment condiments must be avoided and large quantities of barley water should be drunk. Indulgence in alcoholic drinks seriously interferes with the efficiency of the treatment, and often brings back the discharge after an apparent recovery.

There have been many serious epidemics of gonorrhœa in children's wards of hospitals or institutions, and in more than

one epidemic several children have died from general peritonitis. It generally happens that a child is admitted without such an infection being diagnosed. The disease having been detected the child should be at once isolated in a separate ward and nursed by special nurses. Some authorities maintain that if the bed is isolated and a special nurse is detailed this is sufficient to prevent the infection of other children in the ward, but such a precaution has failed on more than one occasion, and has been the cause of a legal action by the parents, resulting in heavy damages. The risk of isolating only the bed is concerned principally with the nursing of the patient, especially at night when, as a rule, there is a limited supply of nurses.

The nurse must be most careful to use every precaution when nursing a case of gonorrhœa, lest she convey the disease to herself, or some other person. Extreme cleanliness is necessary ; thus she should wear an overall and india-rubber gloves, all dressings which have been in contact with the discharge should be burnt, soiled linen should be soaked in carbolic solution 1 in 20, and bed-pans and the douche apparatus should be thoroughly cleansed and sterilized after use.

Gonorrhœal Warts of the Vulva.—These warts, caused in chronic cases by the long-continued irritation of the discharge, may become infected, when ulceration results, the discharge being horribly offensive. The warts will disappear if the discharge is treated, and their surface is kept dry with a dusting powder containing calomel and zinc oxide.

SOFT SORES.

CAUSE.—

The soft sores result from infection by Ducrey's bacillus. It is purely a local affection and remains so. The condition is very contagious.

SYMPTOMS AND SIGNS.—

Within 3 days of infection the patient will complain of pain, heat in, and a profuse discharge from the vulva.

The local condition commences with a series of pustules which soon break down into small ulcers. The ulcers are round, sharply cut and their base is covered by a grey-yellowish

slough. The ulcers secrete a purulent discharge. The lymphatic glands in the groin become enlarged, inflamed, painful and may suppurate.

TREATMENT.—

Soft chancres are easily cured by strict cleanliness and by the application of antiseptic lotions, after which an antiseptic dusting powder is applied to keep the affected parts dry. The patient should be kept in bed, and suppurating glands opened.

The nurse, when attending patients the subjects of soft sore, must take precautions similar to those advised under the sections dealing with syphilis and gonorrhœa, lest she herself becomes inoculated.

The Nursing of Venereal Diseases.

When nursing patients suffering from syphilis, soft chancre or gonorrhœa, the nurse should realize that she is liable to be infected only by actual contact with the sore or discharge. The routine methods of disinfection and precaution practised when nursing septic patients will, therefore, if conscientiously carried out, protect the nurse from any risk of infection. Moreover, when attending a patient known to be suffering from one or other of these diseases, the nurse will have the added safeguard of being aware of the danger, instead of dealing with it, all unrecognized, as happens, in many obscure ways, in the general wards.

Although, as a rule, syphilis is due to irregular sexual relations, it is often contracted quite innocently, as when a man infects his wife and she in her turn her unborn child. Moreover, as already stated, the infection may be otherwise indirect.

It is well known that in time of war this disease becomes more prevalent. Thus, according to the returns from Clinics, which treat the majority of cases, in England and Wales in 1931 there were about 9000 cases of syphilis, and in 1939 this figure had fallen below 5000. Before the war, from information received, syphilis in our country was far less than in most other countries, and up to the present the increase has been much lower than in the last war. Nevertheless, the figure in 1941 has increased by 70 per cent. and this figure may not be correct because of secrecy.

The real tragedy is that there has been a taboo in polite society regarding the discussion of venereal diseases. Syphilis presents similar problems to other infectious diseases such as small-pox, typhoid fever and so on, and while everyone knows about and discusses means of prevention in the latter, and the great importance of precaution, early diagnosis and adequate treatment, the great pox (as it was termed in ancient times) has always been treated as a " hush-hush matter." This is disastrous seeing that syphilis can be diagnosed with certainty, and if taken in hand sufficiently early can be cured in the vast majority of cases. The difficulty is to get the community to co-operate because of this absurd and unfortunate secrecy.

One cannot hope to deal with syphilis by shutting ones eyes to its existence but only by discussing it and informing the community of its dangers. The public should be prepared to co-operate with the responsible authorities since by such measures the incidence of this disease could be remarkably reduced. " There is no worse menace to the Nation's well-being than syphilis which, since it can infect even unborn children, may carry forward its hateful legacy from generation to generation."

The figures for gonorrhœa are not so accurate, but since it has been calculated that there are about 8 cases of gonorrhœa to one of syphilis, this makes a total of 60,000 cases a year of venereal disease among the civilian population.

It is everyone's duty to co-operate, and nurses have a real responsibility in this respect, and with practical common sense they may lead women suffering from venereal disease to realize the danger to the community of their condition.

" Every untreated case of venereal disease constitutes a threat not only to the liberty but also to the life of others who, though without blame, may be involved in all the perils of promiscuity. These diseases belong to a category in which cure and prevention are so closely linked as to be almost identical. The real enemy is secrecy, and to overcome the motives for secrecy is a prime condition of successful reform in this field."

The nurse must never express the opinion or even hint that her patient has venereal disease. By so doing she may expose herself to legal action.

CHAPTER XVII.

INFECTION OF THE FEMALE URINARY TRACT.

THE BLADDER AND URETHRA.—Infection of the bladder or urethra may spread to the kidney so causing pyelitis or pyelonephritis (Fig. 22).

CYSTITIS.

Acute Cystitis.—

CAUSE.—

Infection of the mucous membrane of the bladder by bacteria, ascends as a rule through the urethral canal or is carried into the bladder by a catheter which has been used without proper precautions, or when purulent urethritis is present. The organisms most usually present are the bacillus coli, streptococci, staphylococci and gonococci. In other cases the infection may descend to the bladder from the kidneys in which case the organisms are the bacillus tuberculosis or bacillus coli.

The nurse must never forget the great danger to the patient of passing a catheter which has not been sterilized by boiling and of not swabbing with an antiseptic the vulva, especially the vestibule, before passing it.

SYMPTOMS AND SIGNS.—

Pain in the perineum and over the pubes. The bladder is very irritable owing to its inflamed mucous membrane. Directly, therefore, urine commences to stretch the bladder, pain results and there is an urgent desire to empty the bladder. The contraction of the bladder necessary to empty it brings about further pain. The patient thus suffers from great frequency of micturition, passing but a small quantity of urine at a time, accompanied by very severe spasmodic pain.

The symptoms of fever are present, more or less severe, and a rigor may occur at the commencement.

The urine is acid, except in those cases in which the urea is split up with the formation of ammonia. It is turbid, contains mucus, pus, and perhaps blood.

TREATMENT.—

The patient must be kept in bed, hot fomentations may be applied to the lower abdomen, and she must be encouraged to drink large quantities of barley water. Until the infecting organism is detected the patient is treated by large doses of alkalis which reduces the temperature and relieves the pain. The antiseptic prescribed will depend on the cause of the infection. Thus, as a rule, streptococcal infection will be treated by sulphanalamide, gonococcal infection by sulphapyridine and staphylococcal infection with sulphathiazole or mandelic acid. Such treatment will not be successful if there is any residual urine.

Chronic Cystitis.—

CAUSE.—

Chronic cystitis is more common ; it may be a sequel of the acute variety. Pathological retention of urine, if unrecognized and, therefore, remaining till too late, may be the cause of acute or chronic cystitis. Attention has already been drawn to the fact that, because of ignorance or carelessness, retention of urine may remain undiagnosed in cases of incontinence of urine.

SYMPTOMS AND SIGNS.—

A constant desire to pass water, and micturition several times during the day and night. As a rule pain of any severity is absent.

The urine is alkaline (except in the case of infection by the colon bacillus when the urine is acid) and is extremely offensive, resembling the odour of decomposing fish. It contains a variable amount of mucus and pus which settles as a deposit on standing.

TREATMENT.—

The doctor will order urinary antiseptics and bladder irrigation (see p. 140), and he will treat the cause.

RESULTS OF CYSTITIS.—

Cystitis is a dangerous condition because of the possibility of the infection spreading up to the kidney by way of the ureters, giving rise to pyelitis (inflammation of the pelvis of the kidney) or pyelo-nephritis (inflammation of the pelvis of the kidney and its substance), which may have a fatal termination.

PYELITIS.

CAUSE.—

In this condition the pelvis of the kidney is infected by bacteria gaining access to it from the blood-stream, the bowel, or *via* the urethra and ureters. Pyelitis occasionally supervenes after an abdominal section, the organism in such cases being the bacillus coli. Pyelitis may be acute or chronic.

SYMPTOMS AND SIGNS.—

In the acute variety the patient is seized with very severe abdominal pain. The temperature is high, irregular, and there may be repeated rigors. The pulse-rate rises to 120 or so, vomiting may be severe, and there is pain in the renal region and great tenderness when the kidney is palpated. The urine is acid, and contains pus and a large quantity of bacilli. The acute condition has often been mistaken for appendicitis, cholecystitis and puerperal sepsis.

In the chronic form the symptoms are not so severe and are principally those of ill-health and backache, with frequency of micturition and a desire to pass urine when the quantity in the bladder may be quite small.

TREATMENT.—

Large quantities of fluid to dilute the urine will be ordered. Since the bacillus coli does not flourish in an alkaline urine, the doctor will prescribe potassium citrate till the urine is alkaline. After this he will prescribe one or other of the urinary antiseptics, already mentioned, according to the nature of the infecting organisms.

CHAPTER XVIII.

TUMOURS AND NEW GROWTHS.

Tumours of the genital organs may be cystic or solid, and these in their turn are innocent or malignant. The seat of cystic tumours is most commonly the ovaries, and of solid tumours the uterus.

Cystic Tumours.—Cystic tumours are found—

In the vulva as Bartholin's cysts.

In the vagina as vaginal cysts.

In the ovaries as ovarian cysts.

In the uterus when fibroids have undergone cystic degeneration.

In the Fallopian tubes as a hydro-salpinx, pyo-salpinx, or hæmato-salpinx.

Cysts of the ovary are either innocent or malignant. The remaining cysts mentioned are innocent.

Solid Tumours.—A solid tumour may be found in any of the genital organs, either as a fibroma, endometrioma, carcinoma, or sarcoma.

A fibroma, or fibroid, is composed of fibrous tissue with a small amount of muscle.

An endometrioma of the uterus is composed of endometrial glands situated between the muscle and fibrous tissue.

A carcinoma is a malignant tumour, and when composed of squamous epithelial cells it is termed a squamous-celled carcinoma, and when of columnar epithelial cells, a columnar-celled carcinoma (glandular-carcinoma or adeno-carcinoma).

A sarcoma is a malignant tumour composed of cells of connective tissue.

In addition the uterus may be the seat of tumours called polypi, which may be composed of fibrous tissue and muscle, the fibroid polypus; of glandular tissue, the mucous polypus, or of retained placental tissue, the placental polypus.

VULVA.

The commonest tumours of the vulva are a Bartholin's cyst, urethral caruncle, and carcinoma, and these only will be dealt with.

Bartholin's Cyst.

CAUSE.—

The duct leading from Bartholin's gland becomes obstructed as the result of inflammation, and the mucus secretion, being unable to escape, accumulates in the gland and converts it into a cyst.

SYMPTOMS AND SIGNS.—

Discomfort in sitting or walking. The swelling is rounded and is situated in the inner surface of the posterior part of the affected labium majus. It may attain the size of an unshelled walnut. It is usually unilateral; when inflamed it is red and very tender.

Bartholinian Abscess.—The cyst may suppurate if infected by the gonococcus or as the result of injury. In this case there is great pain on sitting and walking, the swelling becomes hard and tender and the adjacent parts are red and œdematous.

TREATMENT.—

The whole of the cyst wall must be dissected out, otherwise if it is only incised the condition may recur. If an abscess forms the cyst must be opened, the interior swabbed with strong antiseptics, and the nurse may be directed to apply hot fomentations if there is much œdema.

Urethral Caruncle.

A small growth on the posterior wall of the urethra, just near its orifice, composed of connective tissue covered by epithelium, and dilated blood-vessels.

CAUSE.—

Probably due to infection of a small gland at the entrance of the urethra known as Skene's tubules. It occurs most

commonly in middle-aged parous women or after the menopause.

SYMPTOMS AND SIGNS.—

The patient may be unaware of its existence or she may complain of dyspareunia, pain on micturition, or otherwise when the caruncle is touched.

Projecting from the orifice of the urethra will be seen a bright red growth generally about the size of a split-pea, and resembling a miniature cockscomb. Caruncles vary in their sensitiveness, some are exquisitely tender, others can be touched without the patient feeling any pain. A few bleed on being touched.

TREATMENT.—

Excision and cauterization of its base since unless the caruncle is entirely destroyed it is apt to return.

Leukoplakia Vulvæ.

A chronic inflammatory condition of the vulva and adjacent skin which should be included under the section dealing with infection. As, however, this disease, unless cured, may be followed by cancer of the vulva, it is dealt with here.

CAUSE.—

The cause is not known. It occurs most frequently in married women at or about the menopause.

SYMPTOMS AND SIGNS.—

The most marked symptom is itching of the vulva which may be very intense and persistent. In addition, when the disease has advanced, fissures or small ulcers, which are painful and tender, will develop.

When well developed, leukoplakia can be diagnosed by a nurse who has had gynæcological experience. The whole of the vulva, except the vestibule, may be attacked. The inner surfaces of the labia majora are smooth as if ironed out, and have the appearance of being covered by a thin layer of milk so that the colour is parchment-like.

TREATMENT.—

For the itching the doctor will prescribe lotions or ointments. In the early stages, especially, hormonal treatment has been found of great value, stilbœstrol being prescribed. Failing this, and more often when ulcers appear, the affected portion is excised.

The nurse should counsel the patient to seek medical advice at once, since the disease, if inefficiently treated, may result in cancer.

Cancer of the Vulva.

As a rule cancer of the vulva first appears when the woman is between 50 and 60 years of age.

SYMPTOMS AND SIGNS.—

The first symptom is pruritus. Later when the growth ulcerates there will be pain, bleeding, and an offensive discharge. Towards the termination of the disease additional signs due to extension of the growth may be due to the escape of urine and fæces from the formation of fistulæ from ulceration into the bladder and rectum, or there may be retention of urine due to the growth obstructing the urethra. What with the loss of sleep from the pain, anæmia from the bleeding, septic absorption from the ulceration, distress caused by the fistulæ, and inability to take food, patients in the last stages of this disease are the subjects of abject misery.

The disease commences as a small hard nodule, most commonly on a labium majus, more rarely on the clitoris. Prior to the appearance of this nodule the vulva has in nearly all cases, if not all, been affected with leukoplakia. It is but rarely that patients consult a doctor when the cancer is in such an early stage. As a rule, the patient first seeks advice because of an ulcer, the edges of which are raised and turned outwards. The glands of the groin become enlarged and hard from lymphatic spread of the growth.

In the last stages the ulceration spreads over the vulva onto the groins, abdomen, and thighs, and death may be hastened by hæmorrhage from the femoral artery.

TREATMENT.—

The nurse should advise a patient to consult a medical practitioner at the earliest moment if her advice is sought, since it is

probable that the most likely treatment to cure the disease is a wide and early removal of the growth and inguinal glands. Radium will ameliorate the disease and, perhaps, in some cases, may cure it, if radium needles are inserted into the growth.

Owing to ignorance of the presence of the growth, carelessness, or disinclination of the woman to seek advice, carcinoma of the vulva does not often come under the care of the gynæcologist in its early stages.

Although not tumours in the generally accepted sense of the term the following swellings of the vulva may be present :—

Hæmatoma of the Vulva.

CAUSE.—

Extravasation of blood due to the rupture of some vessel by a kick or fall, by subcutaneous rupture of varicose veins of the vulva, or sometimes by the pressure of the fœtal head during delivery.

SYMPTOMS AND SIGNS.—

There may be a history of injury.

The swelling is tender and discoloured and may be in any part of the vulva. Rarely it suppurates.

During labour the formation of a hæmatoma of the vulva may cause a serious obstruction to the birth of the child.

TREATMENT.—

The doctor will order cold lead compresses to be applied to the swelling, and on occasions will incise it and evacuate the blood-clot.

Inguinal Hernia.

SIGNS.—

A swelling, due to the presence of intestine in the anterior end of the labium majus, which disappears when the patient lies down and, as a rule, gives an impulse when she coughs.

The swelling can generally be pushed back into the abdominal cavity and kept there by a truss. Occasionally part of the bowel gets nipped and gives rise to symptoms of strangulation, which if not relieved is fatal.

TREATMENT.—

The condition should be cured by operation unless the patient is not fit for such treatment and the bowel can be replaced, when a truss will have to be worn.

Varicose Veins of the Vulva.

SYMPTOMS AND SIGNS.—

This condition, as a rule, does not cause much trouble, except an aching and occasionally pruritus.

Varicose veins, however, may be a source of great danger if they burst, since the woman may bleed to death if pressure is not applied to the bleeding point.

During pregnancy the veins may become very enlarged forming cords the size of the little finger, stretching up on to the abdomen and down on to the thighs, and in some cases obscuring the vulva.

TREATMENT.—

Pregnancy may have to be terminated prematurely, lest the veins should cause an obstruction during labour, or burst. In the non-pregnant woman the varicose veins must be excised if they cause trouble.

VAGINA.

The vagina may be the seat of a cyst due to congenital causes ; of a fibroid which occasionally occurs, and of carcinoma, sarcoma or chorion epithelioma, all of which are very rare.

SYMPTOMS.—

In carcinoma and sarcoma the patient will complain of an offensive watery discharge and of bleeding after douching or coitus. Chorion epithelioma, which appears as a purple nodule, is associated with pregnancy.

TREATMENT.—

Surgical.

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CHAPTER XIX.

TUMOURS OF THE UTERUS.

THE commonest tumours of the uterus are a fibroid, an endo-metrioma, a polypus, and cancer.

Fibroid Tumours.

These are composed of muscle fibres and fibrous tissue.

Statistics of the dead-house show that 40 per cent. of women over 50 years of age have fibroid tumours.

These statistics, however, include fibroids, not larger than a pea, which in the great majority of women never cause any trouble and are only found on the routine inspection when operating or in the postmortem room.

On the other hand, both by growth and by changes taking place in them, fibroids may be directly responsible for the death of the patient. The majority of fibroids giving rise to symptoms first cause trouble between the ages of 30 and 40. Fibroids are more often multiple than single, and one or more of the following varieties may be present in the same uterus according to their position : pedunculated subperi-toneal, subperitoneal, interstitial, submucous, and pedun-culated submucous.

A pedunculated subperitoneal fibroid is one which is projecting into the abdominal cavity, and is attached to the external surface of the uterus by a stalk.

A subperitoneal fibroid is one projecting from the ex-ternal surface of the uterus just under the peritoneum, so that the outer surface of the uterus is uneven.

An interstitial fibroid is one growing in the wall of the uterus, and not projecting beyond either its external or internal surface.

A submucous fibroid projects into the cavity of the uterus pushing the mucous membrane before it, and causing the internal surface to be irregular.

A pedunculated submucous fibroid or, as it is generally termed, a fibroid polypus, is in reality a later stage of a submucous fibroid. The tumour, which is covered with mucous membrane, is expelled from the uterine wall into
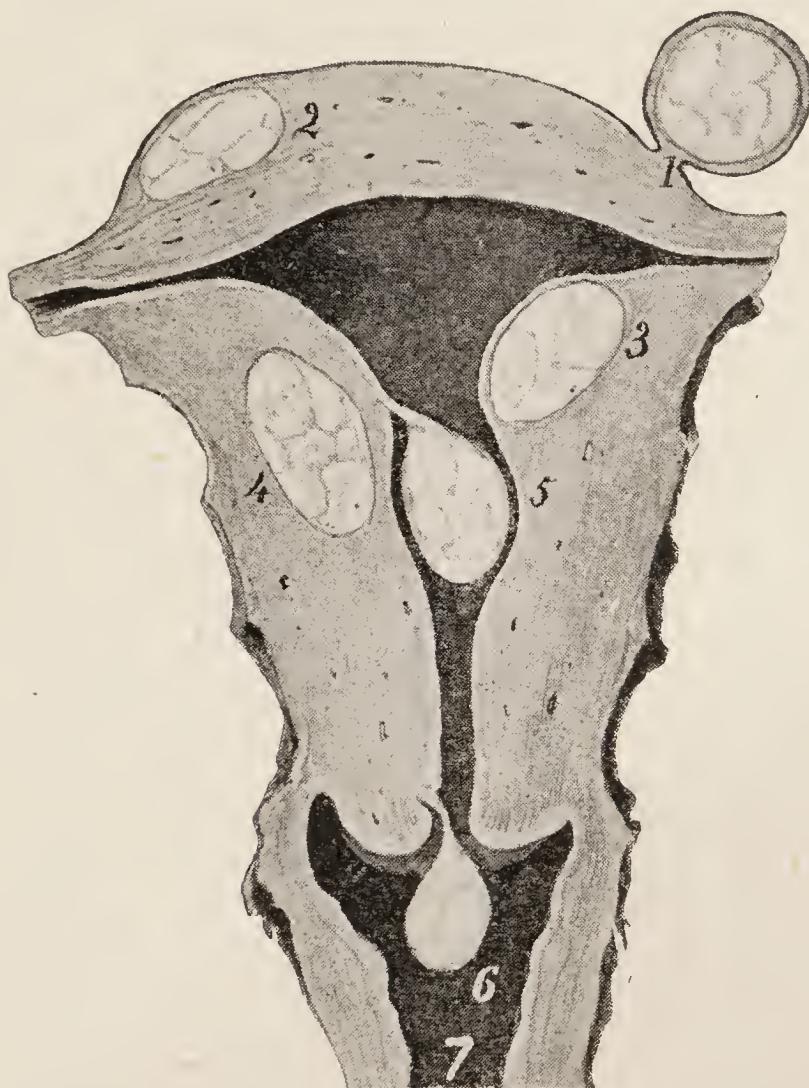
FIG. 24.—A uterus, the seat of multiple fibroids, cut in half to show the directions in which a fibroid may grow, starting as an interstitial fibroid. 1. Pedunculated subperitoneal ; 2. Subperitoneal ; 3. Submucous ; 4. Interstitial ; 5. Fibroid polypus of body ; 6. Fibroid polypus of neck of uterus ; 7. Vagina.

the cavity of the uterus, and later, perhaps, into the vagina, all except a small portion which forms a stalk.

SYMPTOMS.—

Menorrhagia, metrorrhagia, leucorrhœa, dysmenorrhœa, sterility and those of pressure.

Menorrhagia, Metrorrhagia.—The amount of hæmorrhage caused by fibroids varies greatly in different women.

The loss in some women is only a slight increase at the periods, in others the menorrhagia is so marked that the term flooding is very commonly given to the profuse hæmorrhage. which may be directly the cause of death. It is only very rarely, however, that a woman dies from hæmorrhage due to fibroids, and then only because the loss has been spread over a long period, and the patient has been allowed to become exsanguinated by inefficient or neglect of treatment.

The different kinds of fibroids vary in the amount of bleeding they are likely to cause, thus, the pedunculated subperitoneal and subperitoneal varieties alone do not give rise to any bleeding. A fibroid polypus, as a rule, causes more hæmorrhage than any other variety. The interstitial and submucous fibroids may cause serious bleeding.

If a fibroid becomes septic, cystic, malignant, or undergoes red degeneration, the amount of blood lost at the period will be increased, and there will be metrorrhagia.

Leucorrhœa.—This may be due to several causes. Since in all varieties, except the pedunculated subperitoneal and subperitoneal, the cavity of the uterus is larger, there is, therefore, a greater surface of mucous membrane lining it, the glands of which increase the normal secretion. The leucorrhœa may be due to congestion, to endometritis, or when purulent to a sloughing fibroid polypus, the discharge being horribly offensive, when the condition may be mistaken for one of cancer.

Dysmenorrhœa.—The pain at the periods associated with fibroids may rarely be due to the fibroid obstructing the escape of blood from the uterus (colicky dysmenorrhœa), but most commonly it is due to congestion (congestive dysmenorrhœa). Since fibroids generally cause symptoms between the ages of 30 to 40, and if, therefore, the patient first complains of dysmenorrhœa at this time, the nurse should suspect the presence of a fibroid and advise the patient to consult a doctor.

Sterility.—Fibroids large enough to be detected on examination, and which give rise to symptoms, are a hindrance to impregnation, but the combination of fibroids and pregnancy is not an uncommon one. Moreover, fibroids first

appear, as a rule, after the most fruitful time for childbearing. Fibroids develop in married women more frequently than in those unmarried.

Pressure Symptoms.—

Pressure on the Bladder and Urethra.—Pressure on the bladder will cause frequency of micturition, and on the neck of the bladder and urethra retention. A significant symptom of the presence of a dangerous variety of fibroid in the uterus is retention of urine for a few hours, or a day, before the period ensues. A history such as this makes it practically certain that a fibroid is almost entirely filling the pelvis, and will then soon be exerting very injurious pressure on the surrounding structures. The extra amount of blood which flows to the uterus and fibroid, a few days before the period is due, causes the fibroid to swell sufficiently to occlude the urethra and so retention results.

Pressure on the Ureters.—A fibroid which is lodged tightly in the pelvis—impacted, as it is termed—will press on the ureters. The kidney may then become diseased by the backward pressure of the urine which has difficulty in flowing into the bladder, and the patient may eventually die of uræmia, if the fibroid is not removed.

Pressure on the Bowel.—The large intestine may be nipped against the brim of the pelvis by a heavy fibroid. The small intestine may become twisted round the stalk of a pedunculated subperitoneal fibroid, and the rectum may be obstructed by an impacted fibroid. In the latter case constipation results, and, in all three, intestinal obstruction or ulceration and perforation of the intestine, with fatal peritonitis, may occur.

Pressure on the Veins.—As a result the patient may suffer from hæmorrhoids, œdema of the legs, varicose veins of the leg or vulva, or thrombosis in the femoral veins.

Pressure on the Nerves.—This may give rise to neuralgia, bearing-down pain, backache, or sciatica.

Pressure on the Diaphragm and Stomach.—With very large fibroids—and formerly growths over 100 pounds in weight have been recorded—the action of the diaphragm is impeded so that the heart and lungs cannot properly perform their

respective functions.   Indigestion may result from pressure on the stomach.

Secondary Changes in Fibroids.—

A fibroid tumour may become septic, cystic, malignant, undergo red degeneration or it may atrophy.

Septic Fibroid.—A septic fibroid is a very dangerous tumour.   The patient is likely to die of peritonitis if the sepsis spreads to the peritoneal cavity, or she may die of septicæmia.   A fibroid may become infected from disease of the bowel, of the appendix, or of the Fallopian tubes.   It may become septic from pressure during labour, or it may be infected in a case of puerperal sepsis after labour.   Lastly, a fibroid polypus becomes septic by bacteria from the vagina infecting it.

SYMPTOMS.—

The patient will have a high temperature, a rapid pulse-rate, perhaps a very fœtid discharge ; the amount of bleeding will increase, the fibroid will be tender, and there will be marked abdominal pain.

Cystic Fibroid.—The solid tumour becomes converted into a cyst, and has thus often been mistaken for pregnancy or an ovarian tumour.

SYMPTOMS.—

The size increases rapidly, and the tumour becomes softer. There may be severe pain, and the amount of blood lost is increased.   Ovarian cysts, as a rule, and pregnancy are associated with amenorrhœa.

Malignant Fibroid.—A fibroid may become so involved through the spreading of a cancer of the uterus.   Very rarely a fibroid may become sarcomatous.   Such a complication would be indicated by very rapid growth, marked bleeding, severe pain and emaciation.

Red Degeneration.—In this condition the fibroid becomes dark red in colour and increases in size.   It is nearly always associated with pregnancy, and may cause trouble then or after labour.   The patient complains of pain, tenderness, and of the symptoms of fever which are present.

Atrophy.—A fibroid in the uterus never appears after the menopause, and at this time if one is present it will atrophy. Such atrophy, except the tumour be smaller than an orange, never goes on to complete disappearance. It is for this reason that a woman nearing the menopause should never be advised to keep her tumour, if it is causing trouble, on the assumption that it will soon disappear. On the contrary, a fibroid is often the cause of trouble at the time of the menopause because of excessive hæmorrhage, or it may become polypoid and septic, as the result of the shrinking uterus forcing the tumour into its cavity and cutting off its blood supply. Lastly, the atrophy may be the direct cause of serious trouble, or even death, if a fibroid which was resting above the brim of the pelvis sinks down in the pelvis owing to its reduction in size and becomes impacted.

METHODS BY WHICH FIBROIDS ENDANGER LIFE.

By hæmorrhage, by sepsis, by pressure, by becoming malignant, by twisting of the pedicle, and by complicating pregnancy, labour, or the puerperium.

The dangers of most of these complications have already been discussed.

Twisting of the Pedicle.—The stalk of a pedunculated subperitoneal fibroid may become twisted in the same manner as that of an ovarian cyst. Pain results, and the tumour may become inflamed and be the cause of internal hæmorrhage through the bursting of veins on its surface.

Effect of Fibroids on Pregnancy.—The pressure symptoms of pregnancy may be more marked, vomiting more troublesome, and in some cases the tumour may possibly favour the occurrence of albuminuria. Pregnant women with fibroids may miscarry due to uterine contractions, or because the uterus has become retroverted, and in some cases also impacted. Accidental hæmorrhage is at times due to a fibroid.

Effect of Pregnancy on the Fibroid.—The fibroid increases in size, and in some cases the change known as red degeneration may appear.

Effect of Fibroids on Labour.—A fibroid may cause obstruction to labour and so, if unrelieved, rupture of the

uterus, owing to its situation below the presenting part and so narrowing the passage, or by causing malpresentation of the child. A fibroid may also cause inertia of the uterus and postpartum hæmorrhage either as a result of this inertia, or because it prevents the proper retraction of the uterus.

Effect of Labour on Fibroids.—A fibroid may be so bruised, owing to the passage of the child, that later it becomes infected. Also the stalk of a pedunculated subperitoneal fibroid may become twisted.

Effect of Fibroids on the Puerperium.—Fibroids are a cause of subinvolution. They may also give rise to secondary postpartum hæmorrhage and, if they become septic, they may cause septicæmia.

Effect of the Puerperium on Fibroids.—A submucous fibroid may, as the uterus shrinks, become converted into a fibroid polypus, and if septic may then become expelled. A fibroid may also undergo red degeneration at this time, and have to be removed. A fibroid may become infected as a result of sepsis due to the infection by bacteria during labour or after.

Although the above is a serious list of complications which may ensue should a woman with a fibroid conceive, yet, as a matter of experience, it is found that in a very large majority of patients the pregnancy, labour, and the puerperium is normal and, therefore, unless some complication does arise, operative treatment is not necessary.

TREATMENT.—

Fibroids need treatment either because they are causing serious hæmorrhage, because they are endangering life by pressure, because some complication arises in them or, more rarely, because of their size.

Hæmorrhage.—

The treatment of hæmorrhage due to fibroids may be divided into three classes :—

1. In which the hæmorrhage is so bad that a surgical operation, myomectomy or hysterectomy, is necessary. Rare.

2. In which the hæmorrhage is severe, but not so severe as to threaten life. The tumour should be removed by

myomectomy, hysterectomy, or removal of a polypus, as the case may be.   Fairly common.

3. In which the hæmorrhage is comparatively slight, and can be controlled by drugs if the patient so decides.   Common.

If the bleeding starts within a year or two of the menopause, and the patient is averse to operation, so long as the bleeding is not imperilling life, drug treatment may be tried. It must always be remembered, however, that the menopause in such cases is apt to be postponed for some time, and also that *increased bleeding in a woman with fibroids near the menopause may be due to cancer of the uterus extending to the fibroid, or to some change in the fibroid.*

Poor patients in which hæmorrhage is a predominant symptom, and who have to earn their own living, should be strongly advised to submit themselves to operation, since if they have to stay away from work 4 or 5 days in each month their employer will probably dismiss them.

In the majority of cases the correct treatment for hæmorrhage due to fibroids, sufficient to make a woman a semi-invalid, is to remove the tumour or tumours.

The mortality of such an operation is so low in the hands of an expert, and the improvement in health, as a result of the operation, is so striking that, with this knowledge, it is now an everyday experience for women, suffering unduly from hæmorrhage due to fibroids, to consult medical men with a view to having them removed.

Pressure.—

If a fibroid is endangering life by pressure it must be removed ; but a difference of opinion arises when life is not endangered, and the difficulty is to decide whether a fibroid which is not bleeding, but is of a fair size, should be removed. Many surgeons think that such a fibroid should be removed because it is a mistaken policy to wait until pressure symptoms have developed, since then the patient will not be so well able to withstand the operation, which itself will be much more difficult and severe than if the fibroid had been removed at an earlier date.

If, on repeated examination, a fibroid, although not causing hæmorrhage, is found to be steadily increasing in size, then it

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will be in the best interests of the patient to remove it before pressure symptoms have developed.

Degeneration.—

If a fibroid becomes septic or cystic, and in many cases of red degeneration, it must be removed forthwith. These complications are rare. If a patient is under medical observation the onset of such degenerations will be detected.

Treatment.—

The operations of hysterectomy or myomectomy for fibroids are, in the hands of skilled operators, very safe, and there have been many series of 100 operations and over reported without a death. If the results of all doctors who perform hysterectomy were collated, the mortality would be found to be very considerably higher than that obtained by expert operators. But even supposing that the death-rate from such operations, by operators skilled in this special branch of surgery, was no greater, or even a shade less, than if these cases were left alone, this would be no good reason for the dictum that all fibroids unassociated with hæmorrhage should be removed as a precaution against the chance of the tumour becoming the seat of some secondary change. If such treatment became recognized and was carried out by doctors not having special experience in this class of work, the operative mortality would at once very seriously increase, and be out of all proportion to the risk incurred by leaving the tumour.

If a fibroid tumour is by its size causing distress it should be removed. In the case of an unmarried woman a fibroid from its size may lead to a suspicion of pregnancy, in which case she would be justified in demanding its removal, even though it was not causing any discomfort.

There are three operations for fibroid tumours of the uterus :—

(1) Total hysterectomy, (2) Sub-total hysterectomy, (3) Myomectomy.

Whether total or sub-total hysterectomy is performed will, in most cases, depend upon the predilection of the operator. Some gynæcologists prefer to remove the whole uterus,

maintaining that it is then impossible for the patient to have cancer of the cervix. It is true that cancer does rarely occur in the cervix after a sub-total hysterectomy, its incidence in such cases is, however, much rarer than cancer of the cervix generally. It is acknowledged that a total hysterectomy is a more serious and dangerous operation because, among other things, of the risk to the ureters, than the sub-total variety and, for this reason, the advocates for sub-total hysterectomy are in the majority.

Myomectomy, or removing the tumour or tumours and leaving the uterus, is the ideal operation in certain circumstances, when, for instance, the patient is single, or if married is sterile and wants a child, and in any case when the patient is under 40 years of age and does not want to lose her uterus. In experienced hands myomectomy is not more dangerous than hysterectomy, but if practised by all and sundry then the results would probably show that it was a far more dangerous operation. The chief disadvantage to myomectomy is that other fibroid tumours may sometimes grow in the uterus, necessitating a hysterectomy later.

Polypi of the Uterus.

Fibroid Polypus.—

This condition has been dealt with under fibroids of the uterus.

Mucous Polypus.—

At times the amount and thickness of the endometrium becomes much increased and, moreover, this increase may be more marked at certain spots than others, with the result that a small projection of mucous membrane is formed, which is called a mucous polypus. There may be one or more of these projections, which may grow from the body or the neck of the uterus. In some cases mucous polypi are the result of infection of the endometrium, but in others evidence of such an infection cannot be ascertained.

Placental Polypus.—

If a piece of placenta remains in the uterus after the expulsion of the membranes and the main portion of the placenta,

the subsequent events depend largely upon whether the portion of placenta retained dies or not.

If it dies, saprophytes infect it. On the other hand, if it is adherent to the uterine wall and well nourished by blood-vessels, it need not die. Then as the blood trickles over this piece of placenta fibrin becomes deposited on it and a small polypus is formed.

SYMPTOMS OF POLYPI.—

Menorrhagia ; metrorrhagia ; vaginal discharge, which in some cases is very offensive ; dysmenorrhœa.

The symptoms will date from labour or abortion.

TREATMENT.—

Removal of the polypus.

Endometrioma.

An endometrioma consists of gland-tubules and connective tissue, exactly like the endometrium and enclosed in the tissue in which they are found.

An endometrioma is generally removed on the supposition that it is a fibroid tumour. The symptoms correspond to those of a fibroid, the most striking of these being an excessive loss at the periods and severe dysmenorrhœa. The uterus will be enlarged but not irregular as in most cases of fibroids. An interesting point concerning endometriomata is that they are found in many other situations beside the uterus ; for instance, in the ovary, Fallopian tube, pelvic peritoneum, recto-vaginal septum, umbilicus and abdominal wall.

In the three former it is supposed that shreds of endometrium pass along the Fallopian tubes to the peritoneal cavity and become attached on the way. In the two latter the shred of endometrium is implanted in the abdominal wound during a hysterectomy or myomectomy.

Cancer of the Uterus.

In the latest statistics of the Registrar-General, 1939, two in every thirteen women died of cancer. If the causes of death in women are tabulated cancer holds the second place with

14·8 per cent., heart disease coming first with 28·8 per cent. If the sites in which cancer caused death in women be taken that of the uterus holds the fourth place, the breast, stomach and intestines being first, second and third in this order. If deaths from cancer of the female genital organs only are taken, cancer of the uterus accounts for 67·1 per cent., and of the other sites 32·9 per cent.

FIG. 25.—Uterus cut in half to show cancer of the neck of the uterus. The cancer is growing from the vaginal portion of the neck of the uterus into the vagina.

The disease may first appear in the body of the uterus or in the neck. Cancer of the body is fairly rare ; most patients suffering from it are between 50 and 60 years of age, and many of them have not had any children.

Cancer of the neck occurs in the majority of cases between 35 and 50, and most of the patients have given birth to one or more children. It forms 90 per cent. of the total number

of cases of cancer of the female genital organs and 95 per cent. of the cases of cancer of the uterus.

CAUSE.—

Cancer is not hereditary, but its incidence is so common that it is not surprising that it should affect members of the same family.
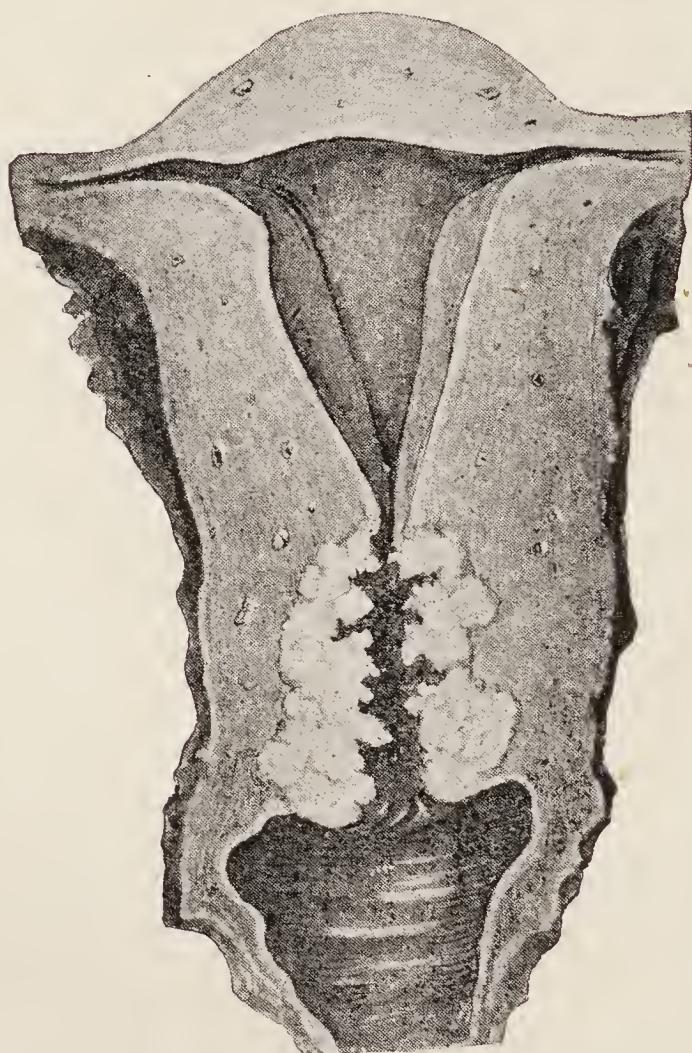
FIG. 26.—Uterus cut in half to show cancer of the neck of the uterus. In this case the cancer is growing from the cervical canal upwards. It does not project into the vagina, so that a doctor on making a vaginal examination would not feel it.

The cause of cancer is not known. It is certain, however, that chronic and prolonged irritation predisposes to malignant disease. Thus cancer of the lip is associated with the long-continued irritation of smoking a clay pipe; of the tongue with irritation of a jagged tooth; of the hands among tar workers, and of the scrotum among mule-spinners due

to irritation of oil on the trousers ; of the intestine at sites where fæcal accumulation and so irritation is more likely, such as the cæcum, hepatic and splenic flexures, the sigmoid colon and the rectum. It may be, therefore, that the laceration of the cervix uteri associated with chronic endocervicitis, which
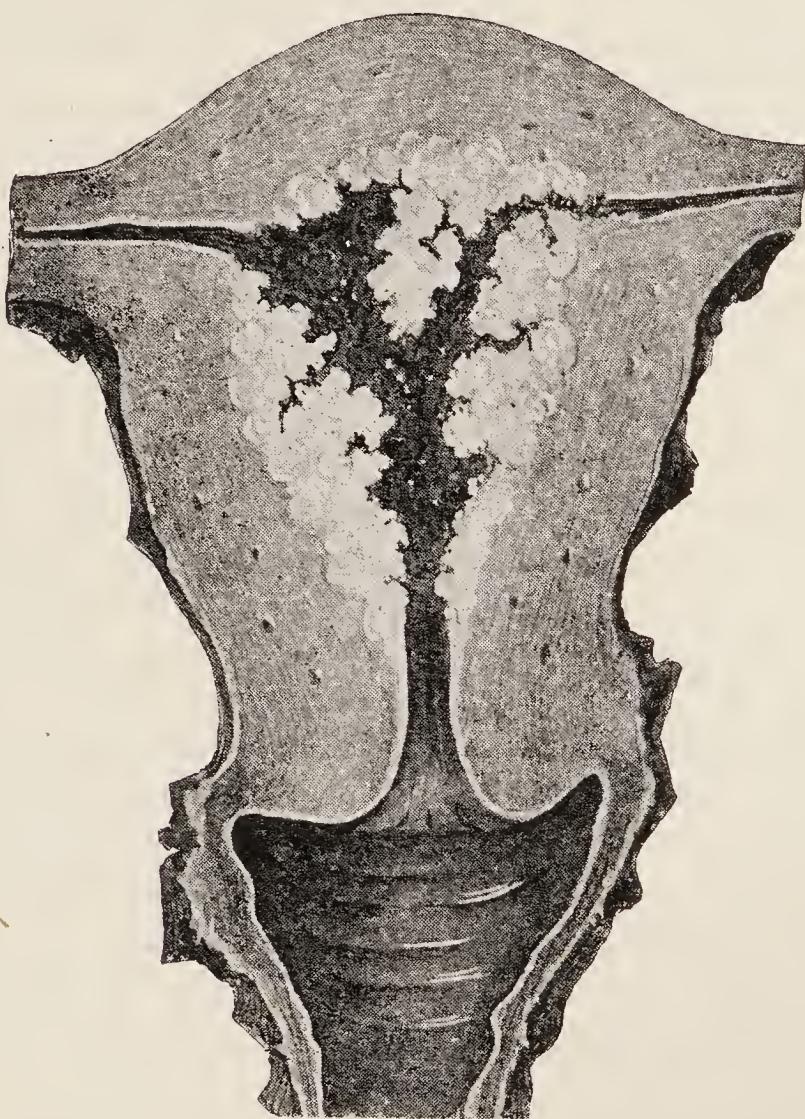
FIG. 27.—Uterus cut in half to show cancer of the body of the uterus. The neck of the uterus is not involved.

is not uncommon in women who have borne children, is a predisposing cause. Why cancer of the neck of the uterus is so much more common than cancer of the body of that organ is probably because the latter occurs more frequently in women who have not borne children, or in whom the percentage of children is less.

SYMPTOMS AND SIGNS.—

Hæmorrhage.—This is the earliest symptom both in cancer of the body and neck of the uterus. Cancer of the body of the uterus may declare itself first as an excess of the period; in the case of cancer of the neck hæmorrhage may appear between the periods and may first appear after douching, or coitus. *Hæmorrhage after the menopause is most likely to be due to cancer of the uterus.*

At times the hæmorrhage is severe, but only seldom is it the immediate cause of death, and then only at a late stage when the ulceration has extended into the uterine artery or one of its larger branches. The bleeding is usually due to rupture of the small blood-vessels in the tumour.

Leucorrhœa.—This is at first due to congestion, and is not offensive. In the later stages it is due to ulceration and septic infection of the growth, and the discharge is then horribly offensive. Unfortunately, women often apply for advice only when the offensive discharge appears, when it is generally too late for radical or radium treatment to be of any permanent use.

Pain.—Pain does not appear till late in cancer of the neck of the uterus because the latter is not sensitive. The pain is due to the growth spreading to surrounding structures. In cancer of the body, on the other hand, pain is much earlier, as the interior part of the uterus is sensitive. When present it is felt in the lower abdomen and sacral region, the groins and thighs.

Cachexia.—Signifies the parchment-like appearance, due to absorption of the septic products in the last stages of the disease. It is accompanied by the symptoms of wasting, loss of appetite, and exhaustion.

DIRECTION IN WHICH THE CANCER OF THE UTERUS SPREADS.

The growth spreads by the blood-vessels and lymphatics :

Downwards.—Onto the vagina, implicating the urethra, and so causing painful micturition and perhaps retention of urine.

Upwards.—To the peritoneum.

Forwards.—Into the bladder, causing cystitis and a vesico-vaginal fistula.

Backwards.—Into the rectum, causing a recto-vaginal fistula.

Outwards.—Into the broad ligaments fixing the uterus and implicating the ureters.

CAUSES OF DEATH.—

The commonest cause of death is exhaustion. After this uræmia claims the greatest number of victims, and is due to the cancer obstructing the ureters and so preventing the sufficient excretion of waste products from the kidney.

The remaining causes of death are hæmorrhage, septi-cæmia, embolism, peritonitis, intestinal obstruction, and secondary deposits in the spine, brain, lungs, liver, and other organs. When compared with the first two causes, the remainder are rare.

TREATMENT.—

The treatment aiming at a cure is operative, or by radium and X-rays.

Operative Treatment.—If a patient suffering from cancer of the cervix is seen sufficiently early, removal of the uterus, the cellular tissue in its neighbourhood, the local lymphatic glands, and the upper part of the vagina (Radical Hysterectomy) by an expert in this class of surgery will certainly lead to the cure of a large number of patients. The most successful operators have a 5-year cure rate of between 30 and 34 per cent. of cases. Unfortunately, many of the patients are first seen by the gynæcologist when the disease is so far advanced that a cure is problematical, or such an operation impossible.

Cancer of the body of the uterus is treated by a total hysterectomy (not of a radical nature) if not seen too late for operative treatment. The prognosis is good, between 60 to 70 per cent. being cured.

Radium Treatment.—The application of radium, when properly carried out, has proved to be a very successful method. The relative merits of the radical operation and the application of radium cannot here be discussed with any advantage. Taking the results of recognized experts, the percentage of women who have had cancer of the cervix and are free from recurrence after 5 years is stated to be as good with radium treatment as with the radical operation ; while

the immediate mortality for the radium treatment is under 3 per cent., that of the radical operation depends on the skill and experience of the operator, varying between 10 and 20 per cent., the average of the leading operators being in the neighbourhood of the former percentage. The operative mortality in early cases is 5 per cent. If, therefore, the question of treatment depends solely on the immediate mortality, the treatment by radium is the safest.

On the other hand, radiology does not cure such advanced cases as the operation performed by expert surgeons, therefore the latter save a certain number of women who would otherwise perish. The radiologists, nevertheless, contend that this fact is more than counterbalanced by the increased operative mortality following the radical operation. The percentage of recoveries after 5 years in the case of the radium treatment, as reported, include a far greater number of early cases than those treated by the radical operation.

One objection to the treatment by radium is that its sphere of action is very limited, and that, therefore, if there are carcinomatous glands present these cannot be destroyed. It is claimed that this drawback can be surmounted by using X-rays in addition to the radium.

A doctor has a very responsible and difficult position when he is asked by his patient which method of treatment should be followed. Probably in early cases the radical operation is most likely to lead to a cure because the regional lymphatic glands can be removed at the same time. It is a fact, however, that the radical operation has been given up by many expert operators in favour of the radium and X-ray treatment.

There are various reasons why delay in seeking advice occurs. Cancer of the uterus commonly appears about the menopause, and the patient thinks, or is told by her friends and even, unfortunately, in some cases by a nurse or her doctor, that the bleeding she complains of is nothing to be alarmed at, and that it is due simply to the " change of life," and so precious time is wasted. In some cases, fortunately a minority, the doctor, even when he is consulted, does not make a vaginal examination. Again, some women who are advised to consult a doctor privately, or go to a hospital for advice, fail to do so until the disease is far advanced.

Moreover, many patients bleed only a little and they are not alarmed till the offensive discharge appears, when it is often too late for any treatment to have a fair chance of cure. Pain, again, in most cases is a very late symptom ; many women shrink from consulting a medical practitioner, dreading a local examination ; and, lastly, others have the fixed idea that cancer is incurable, so are not anxious to learn the worst.

Patients are so often ignorant of the early symptoms of cancer that a great responsibility rests on the nurse if she is first consulted by a woman complaining of the above-mentioned symptoms.

Every nurse, therefore, should know the symptoms of cancer of the uterus, so that when she meets a woman complaining of any of them she can advise her at once to *consult a doctor and insist on his examining her internally.*

It is now proved beyond doubt that cancer of the uterus is curable if only the patient is treated at a sufficiently early stage of the disease.

Palliative Treatment.—This consists in remedies for the bleeding, discharge, and pain when the condition is too advanced for curative treatment.

For the bleeding the growth can be curetted or radium applied. The nurse may be called upon to treat a sudden severe hæmorrhage, in which case she should give hot douches (118° F.), and if this does not stop the bleeding the vagina may have to be plugged.

Leucorrhœa will be treated by various douches, those helping to destroy the odour, such as iodine, sanitas, or permanganate of potash, being most often used. The ulcerating growth may be curetted.

The discharge may also cause pruritus, which can be treated first by douching and then by smearing the vulva with a mixture of equal parts of castor oil and zinc ointment.

The best method of diminishing the odour in advanced cases is scrupulous cleanliness (the pads, sheets, nightgowns being changed whenever soiled), douching, and plenty of fresh air in the room.

Pain is best treated by changing the nature of the analgesic directly it commences to lose its effect. Towards the end, injections of morphia will have to be given. As a routine treatment it has been found in the Cancer Wing of the

Middlesex Hospital that aspirin gives the most relief before
the administration of morphia becomes necessary.

What with the pain, bleeding, discharge, emaciation,
the results of vesico-vaginal and recto-vaginal fistulæ and
perhaps bed-sores which attend these pitiable cases in the
last stages of cancer, only a State Registered Nurse is capable
of properly looking after them.

SARCOMA OF THE UTERUS.

This form of malignant disease of the uterus is very rare.
Since the symptoms and signs of sarcoma, so far as a nurse
is concerned, are comparable to those of carcinoma in that
organ, they need not be further considered. One variety
occurs in the neck of the uterus in very young children.

The duties of the nurse are the same as described for
carcinoma.

CHORION-EPITHELIOMA.

This is a very rare and intensely malignant form of disease.
The tumour consists of a mass of trophoblastic cells (those
cells forming the outer layer of chorionic villi) and maternal
blood. From the nature of the tumour it is obvious that the
patient must have been pregnant.

The history of such a case is that some time after a mis-
carriage or labour the patient suffers from severe bleeding.
As parts of the tumour necrose there is an offensive discharge.
Since fever is not unlikely to be present such cases are, at
times, attributed to puerperal sepsis. On the other hand,
they may just be attributed to subinvolution of the uterus if
hæmorrhage is the important symptom, and only on an intra-
uterine examination is the nature of the disease discovered.
Secondary deposits appear early in the lungs giving rise to
hæmoptysis, and in other organs of the body. Most of the
patients die in a few months in spite of operation. A few
have recovered after such treatment.

Treatment.—Total hysterectomy.

CHAPTER XX.

TUMOURS OF THE OVARIES.

OVARIAN tumours are either cystic or solid, 95 per cent. being cystic.

CYSTIC OVARIAN TUMOURS.

Cystic ovarian tumours may be classified into follicular, glandular, endometrial, embryonal, and papillomatous, the difference depending upon their structure and the nature of the fluid they contain. Ovarian cysts may be innocent or malignant and unilateral or bilateral.

Follicular Cysts.—These tumours originate in Graafian follicles or in corpora lutea, except the endometrial cyst, which is due to transplantation of endometrium. They do not grow to any large size.

The fluid in the endometrial cyst is menstrual blood (chocolate cysts of the ovary). The fluid in the other two cysts is clear and straw-coloured.

Glandular Ovarian Cysts.—These tumours are more complicated in structure. They may be unilocular or multi-locular. The walls of the cyst are partly composed of glands, and the fluid they secrete (mucus) is thick, tenacious, and greenish in colour, if not altered by inflammation or bleeding, when it may be yellow from the presence of pus, or red, chocolate-coloured, or black from mixture with blood. Should the mucus escape into the peritoneal cavity, following rupture of the cyst, it does not do any immediate harm, but, as the glands in the cyst-wall continue to secrete, the mucus gradually distends the abdominal cavity to such an extent that life may be endangered from the pressure the fluid exerts.

A certain proportion of glandular ovarian cysts are malignant.

The cancer, however, has not always started in the ovary. It may have occurred primarily in the breast or stomach and, spreading by the lymphatics, affected the ovary secondarily.

Embryonal Cysts.—The source of origin of these tumours is still a matter of speculation, and there is no need here to discuss the various theories. These tumours, commonly called dermoid cysts, are very interesting, inasmuch as they may contain teeth, hair, bones, breast-tissue on which may be situated nipples, nervous-tissue, skin, mucous membrane, sweat and fat glands. Of these, teeth are most commonly
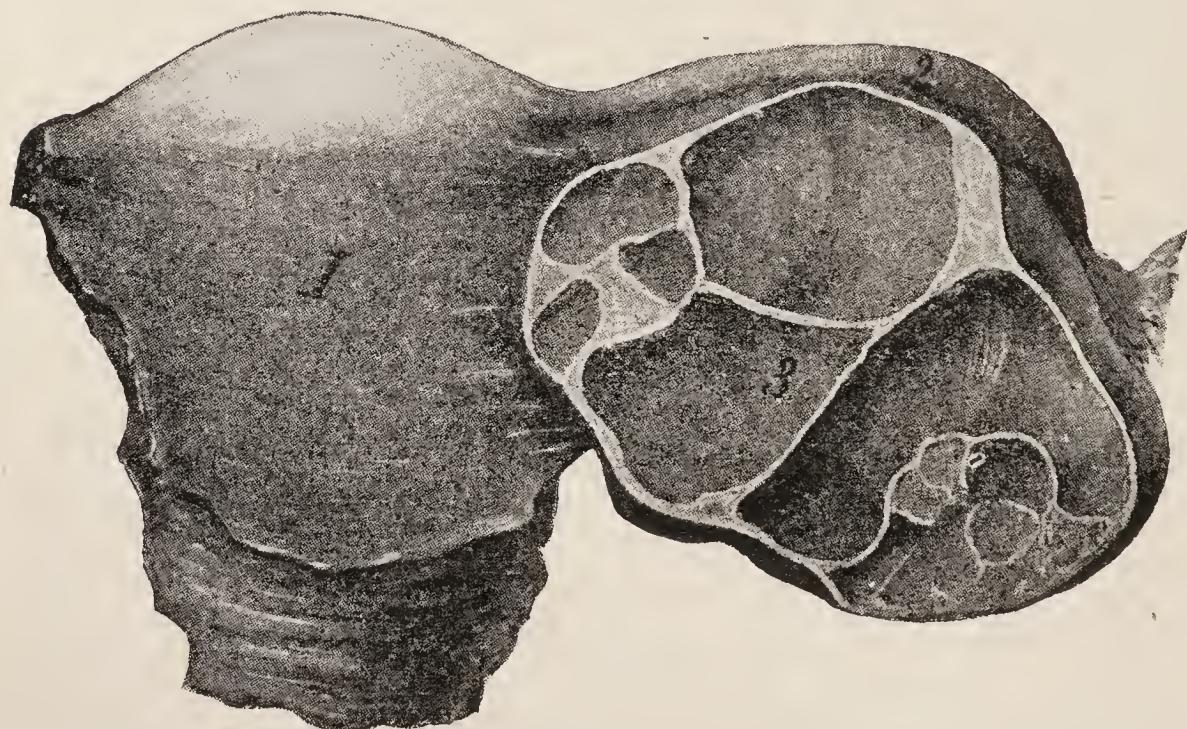
FIG. 28.—Ovarian cyst cut in half to show the compartments in one variety of cyst, the multilocular. 1. Uterus; 2. Fallopian tube; 3. Ovarian cyst.

present, as a rule only two or three, but over a hundred have been found. The length of the hair varies, generally it is short, but it has been found several feet long. The colour does not correspond with that of the patient's hair, but it becomes grey with advancing age. At times these structures are arranged in such a way that they appear very like an embryo without its head but with limbs, attached to the wall of the cyst and projecting into its cavity.

The fluid the cyst contains is liquid fat, which solidifies when poured into a basin; if this fat escapes into the

peritoneal cavity severe peritonitis may be set up, causing the death of the patient.

Papillomatous Ovarian Cysts.—These are usually first detected after puberty, but are sometimes found in young children. Attached to the wall of these cysts and projecting into their cavities are small papillomatous processes having the appearance of warts, hence their name. If these wart-like structures escape into the peritoneal cavity, by rupture of the cyst or perforation of its wall, they become adherent to the viscera and peritoneum and continue to grow, and as a result of their irritation fluid accumulates in the peritoneal cavity.

These papillomatous growths are of two varieties, malignant and non-malignant. The former continue to grow till the patient dies. The latter live only a certain time and then disappear ; but since their place is taken by other warts, the result, if the tumour is not removed, is the same as if they were cancerous. On the other hand, if the tumour is removed, then in the non-malignant variety the patient recovers, because the growths which are adherent to the viscera at the time of the operation disappear soon afterwards and there are no fresh ones to take their place.

In the case of the malignant variety removal of the tumour will not cure the patient if any of the papillomatous growths have once escaped from the cyst and become implanted elsewhere since, although fresh growths cannot become engrafted, yet those already present continue to grow.

SYMPTOMS AND SIGNS.—

Enlargement of the Abdomen.—If the cyst is large and not in the pelvis.

Amenorrhœa.—Unless it is due to depreciation in health, amenorrhœa in association with ovarian cysts results only when the tissue of both ovaries is destroyed. After the menopause ovarian tumours may cause a loss of blood from the uterus, but in such a case cancer of the uterus is far more likely.

Pressure.—Pressure on the bladder and rectum will give rise to frequency of micturition, constipation, and hæmorrhoids ; on the stomach to indigestion ; on the diaphragm it impedes

the action of the heart and of the lungs, and on the veins it causes œdema of the legs and ascites.

Emaciation.—If the disease is advanced, or if suppuration has taken place in the cyst, the patient becomes emaciated, as also she does if the cyst is malignant.

METHODS BY WHICH OVARIAN TUMOURS ENDANGER LIFE.

By their size.

By the complications of rupture, inflammation, twisting of the pedicle or hæmorrhage.

By their being malignant.

By their association with pregnancy, labour, or the puerperium.

By pressure on the ureters.

By intestinal obstruction.

Size.—

It is unusual nowadays to meet with large ovarian cysts.

Formerly ovarian cysts of enormous size were quite common, and even nowadays, in out-of-the-way places which doctors do not often visit, among uncivilized nations, or in women who refuse to consult a doctor or listen to his advice, very large tumours may occasionally be found.

One of the largest on record weighed 227 pounds, the fluid it contained measuring 88 quarts.

Rupture.—

CAUSE.—

The wall of the cyst becomes so thin from pressure of the contained fluid that it tears, or the wall of the cyst may become diseased and give way, or by papillomatous growths perforating its wall. Rupture may also be caused by blows or falls, especially against some sharp object such as the edge of a table; during labour; by twisting of the pedicle; by compression of the tumour by the abdominal muscles and contents during laughing, coughing, or stooping to button the boots, and during examination by the doctor.

A case is on record in which a patient with an ovarian cyst was ascending in a lift, the machinery of which broke.

The concussion, caused by the lift falling, burst the cyst and the patient was cured.

SYMPTOMS.—

Immediate Symptoms.—Sudden pain in the abdomen and disappearance of the abdominal swelling if there is one ; in addition there may be symptoms of internal hæmorrhage, when the cyst wall is torn, if a blood-vessel is severed and remains patent.

Remote Symptoms.—These depend on the nature of the fluid contained in the cyst. For instance, in a follicular cyst harm may not result ; in a glandular cyst the mucus which is secreted will gradually fill the abdominal cavity, would eventually kill the patient if it were not removed ; in an embryonal cyst the contents are likely to set up peritonitis, which may be fatal. In a papillomatous cyst the growths, becoming scattered, cause, by their irritation, a large amount of fluid to collect in the abdominal cavity.

Formerly when ovariotomy was not performed, patients were tapped when the accumulation of fluid became too great. As an example of the amount of fluid which can be secreted by an ovarian cyst, the following is an account of a specimen preserved in the museum of the Royal College of Surgeons : " The patient was 27 years old when the disease commenced, after a miscarriage with her first child. Between the year 1757 and August, 1783, when she died, she was tapped 80 times, and a total of 6631 pints or over 13 hogsheads, were removed from her." Just before her death the fluid accumulated at the rate of $3\frac{1}{2}$ pints a day.

Inflammation.—

CAUSE.—

Infection may be due to bacteria escaping from the intestine, the vermiform appendix, or an inflamed Fallopian tube.

A patient, having an ovarian cyst and suffering from puerperal sepsis, or typhoid fever, may have the cyst infected by the streptococcus or the typhoid bacillus. An ovarian cyst may be bruised during labour and then inflame. The commonest cause of the inflammation is twisting of its pedicle.

If the inflammation is acute the cyst becomes filled with

pus, and the pus may burst into the intestine, bladder, vagina, or through the abdominal wall.

In less acute cases adhesions are formed so that the cyst is bound down to the structures in its neighbourhood, and its removal becomes a highly dangerous procedure.

SYMPTOMS AND SIGNS.—

Great abdominal pain, and those of fever. The pulse-rate is rapid, the temperature high with marked intermissions, the abdominal swelling, if there is one, is very tender and tense, and there is emaciation.

Twisting of the Pedicle.—Ovarian cysts are attached to the uterus and broad ligaments by a stalk, or pedicle, composed of the ovarian blood-vessels and other structures. Under certain conditions this pedicle becomes twisted, with the result that several well-defined symptoms appear.

The torsion may occur slowly or suddenly.

CAUSE.—

Twisting of the pedicle is due to a rotatory movement of the ovarian cyst. This may be brought about by the resistance of swellings in its immediate neighbourhood, such as a pregnant uterus or a fibroid tumour of the uterus, or another ovarian cyst. Twisting of the pedicle has also been thought by some to be due to the alternate filling and emptying of the bladder and rectum, and its occurrence after labour is probably due to the rapid decrease in size of the uterus.

When the pedicle is twisted the veins in it are occluded, while the arteries remain patent. Blood which is pumped into the cyst-wall by the ovarian artery is, therefore, unable to escape by the ovarian vein, with the result that the cyst soon becomes very congested. Some of the small blood-vessels in the wall of the cyst then burst, and blood is extravasated. In addition, a larger vessel may rupture when the blood escapes into the cyst cavity, which may then become so distended that its wall tears.

SYMPTOMS AND SIGNS.—

As a rule the twisting occurs slowly. The patient in this case complains of recurrent abdominal pain, and the tumour

is tender. If the twisting is acute there is sudden and great abdominal pain, accompanied by vomiting. The condition is one of acute abdomen, and, if the presence of the tumour remains undetected, the condition may be diagnosed as acute intestinal obstruction or appendicitis. In addition, if any large blood-vessel has ruptured there may be the symptoms of internal hæmorrhage.

In a certain percentage of cases there will also be present, in a day or two, symptoms of inflammation of the cyst. The signs are those of rupture, inflammation, or hæmorrhage as the case may be.
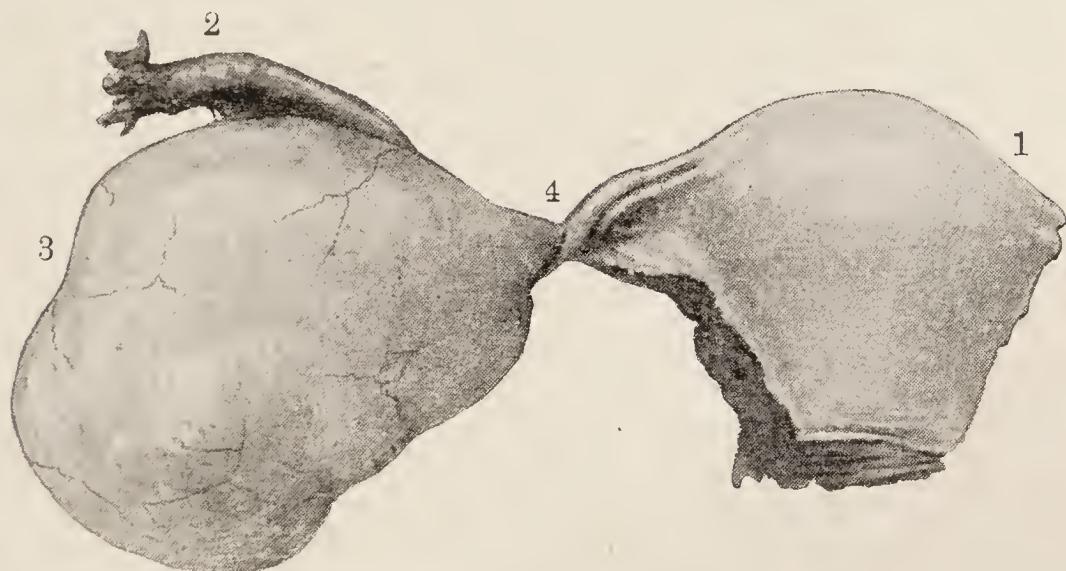
FIG. 29.—An ovarian cyst with a twisted pedicle. 1. Uterus 2. Fallopian tube ; 3. Cyst ; 4. Twisted pedicle.

Hæmorrhage.—

Cause.—

Bleeding from the vessels in the wall of an ovarian cyst may be due to its rupture, to twisting of its pedicle, to suppuration into a blood-vessel, or to a papillomatous growth penetrating a blood-vessel in the cyst wall.

Symptoms and Signs.—

The symptoms and signs of bleeding from, or into, an ovarian cyst are those of internal hæmorrhage, together with pain, and if the cyst has ruptured, those of this complication in addition.

Cancer.—

SYMPTOMS AND SIGNS.—

Whether an ovarian cyst is malignant or not can be determined for certain only by a microscopical examination of the tumour after its removal, unless the tumour is secondary to carcinoma in some other organ, such as the heart, stomach, large intestine, liver or uterus, or secondary growths are found in the omentum and elsewhere. The fact that the tumour has grown rapidly, that it is bilateral, that the patient is emaciated, that there is marked ascites and unilateral œdema of the legs and vulva should awaken suspicion of malignancy. Bleeding from the uterus after the menopause, in association with an ovarian cyst, suggests that the latter may be malignant.

Pressure on the Ureter.—

Very large cysts, or cysts tightly impacted in the pelvis, may press dangerously on the ureters.

As a result albuminuria may result, and later, if the tumour is not removed, the kidneys become irretrievably damaged, and the patient dies from uræmia.

Obstruction of the Bowels.—

The bowels may be obstructed by becoming adherent to the tumour or by a portion of them becoming caught in the pedicle when it twists.

Associated with Pregnancy.—

The pressure symptoms of pregnancy become more marked. Vomiting is likely to be troublesome. The patient may miscarry. There is a predisposition to albuminuria and eclampsia. The cyst may cause retroversion of the gravid uterus which may then become incarcerated and miscarriage may occur.

The cyst grows more rapidly. It may rupture, its pedicle may become twisted, it may inflame, or it may become impacted below the uterus so interfering with micturition and defæcation.

Associated with Labour.—

If in the pelvis it may prevent the head from descending, or if in the abdomen cause some malpresentation of the child. As a result an obstruction occurs and if unrelieved the uterus may rupture.

The contracting uterus may cause twisting of the pedicle, it may rupture the cyst, or it may bruise the cyst wall so that later it inflames.

Associated with the Puerperium.—

As a result of the twisting of the pedicle, or bruising during labour, the cyst may become inflamed. The patient then becomes septic, and if the tumour is not discovered the condition is diagnosed as puerperal sepsis. There have been many cases of such a mistaken diagnosis, discovered on post-mortem examination.

The pedicle of the cyst may become twisted, or in cases of septicæmia the cyst may become infected and suppurate.

TREATMENT.—

Every ovarian cyst should be removed as soon after its discovery as possible; the treatment thus differing markedly from that of a fibroid of the uterus. This does not mean that necessarily the whole ovary should be removed. In many cases it is found that the cyst can be dissected out and the whole or a portion of the ovary left. This should always be done if possible. If there is any reason to suspect that the cyst is malignant, then the whole ovary should be removed as it should be in cases of papillomatous cysts.

An ovarian cyst should be removed for the following reasons :—

With the rare exception of a follicular cyst bursting and becoming cured, the cyst would certainly kill the patient in the end. It is liable to serious complications. The longer it is left the more dangerous may be its removal. It may be malignant, when the only chance the woman has of a cure lies in its removal before the cancer has spread to other structures.

This rule admits of but very few exceptions which, in the absence of some complication in the tumour, are—

1. If the patient is so desperately ill that an anæsthetic or operation would kill her, the tumour must then be tapped.

2. If the tumour complicates pregnancy and the mother is a primigravida within a few years of her menopause. Since 19·5 per cent. of pregnant women miscarry when operated upon for an ovarian cyst, it would be wiser to wait, if possible, till the pregnancy was at its 34th or 36th week, when the child will have a good chance of surviving, since the patient, because of her age, may not again become pregnant.

3. When complicating pregnancy there are two ovarian tumours; in such a case the patient will have only this one chance of having a child unless the cysts, or one of them, can be enucleated from ovarian tissue, and since there is a danger of miscarriage if an operation is performed, the patient may decide to postpone the operation if possible till the 36th week.

SOLID OVARIAN TUMOURS.

Solid ovarian tumours may be unilateral or bilateral and malignant or non-malignant. The commonest non-malignant variety is a fibroid tumour similar in structure to that found in the uterus. There are other varieties of solid ovarian tumours, but these are so rare that they need not here be dealt with.

SYMPTOMS.—

Solid ovarian tumours do not give rise to much trouble in their early stages. They are generally discovered accidentally, except in the case of the malignant forms which after some time, owing to their invasion of adjacent structures, and effect on the general health of the patient, cause her to seek advice.

Solid ovarian tumours are sometimes mistaken for a fibroid of the uterus, but their presence is a cause of ascites which is not associated with a simple fibroid of the uterus.

TREATMENT.—

Solid ovarian tumours should be removed at the earliest opportunity, since until they are removed there are no certain means of telling whether the tumour is malignant or not.

BROAD LIGAMENT CYSTS.

These cysts arise in certain developmental structures situated between the two layers of the broad ligaments, and are unilocular. The fluid content is clear and like water, and harm does not result, perhaps a cure, if the cyst bursts. The symptoms and signs are somewhat similar to those of ovarian cysts and the treatment the same.

TUMOURS OF THE FALLOPIAN TUBE.

Solid tumours of the Fallopian tube may be simple, such as a fibroid, or malignant. In any case they are very rare and need not here be dealt with.

INJURIES.

The uterus, vagina, labia, and perineum may be torn during labour. The vulva and vagina may be injured by an accident, or as the result of violence or rape. A tear in the perineum may extend into the rectum during instrumental delivery, or otherwise during the birth of the child, resulting later, perhaps, in a recto-vaginal fistula. The vagina may be bruised by pressure of the head of the child if it is delayed in the cavity of the pelvis, and sloughing into the bladder a vesico-vaginal fistula is formed in 5 days. Such a fistula may also be caused at once by injury by the forceps during instrumental extraction of the child. The vagina may be injured by a pessary ulcerating through the vaginal wall and even into the bladder, when it has not been properly attended to.

The Fallopian tube may be torn as a result of pregnancy occurring therein.

MALFORMATIONS.

The internal genital organs are developed partly from certain cells found in the embryo each side of its spine, and partly from two solid columns of cells which eventually become canalized, these tubes being named the Mullerian and Wolffian ducts, which extend from the region of the kidneys to the pelvis.

The cells become either ovaries or testes according to the

sex. In the female the upper parts of the Mullerian ducts form the Fallopian tubes and then uniting form the uterus. The Wolffian ducts unite to form the vagina.

The external genital organs are formed by certain folds and dimples in the skin.

Malformations of the genital organs are of two kinds, either the sexes may be combined, or the organs peculiar to one sex or the other may not become properly developed.

Combination of the Sexes.—Owing to some error in development, either in the cells or in the tubes, or in the foldings of the skin, an individual may have the internal genital organs of a woman and the external genital organs of a man, or *vice versa*. Such individuals are often called hermaphrodites, but true hermaphrodites must have a complete set of male and female genital organs. In the human race, however, no case has been reported in which in addition to all the other genital organs there were present ovaries and testes. In all cases reported there have been only one set of these organs present, either ovaries or testes, and the proper term for such an individual is a pseudo-hermaphrodite.

Genital Organs not Properly Developed.—It is necessary here only to discuss the result of such maldevelopment in females. If the Mullerian and Wolffian ducts remain separate, then the woman has a double uterus and vagina.

If the ducts join first at the upper end of the vagina, then she has a double uterus. If the column of cells which would form the vagina do not become canalized, the vagina is absent, or part may become canalized and part not.

The internal and external genital organs become connected by the Wolffian ducts growing downwards towards the dimpling in the skin which forms the vulva. A membrane is formed where these two meet, just at the vulval orifice, and is called the hymen. By the perforation of this membrane the vulva leads into the vagina. If this perforation does not take place the condition known as imperforate hymen results, which leads to the menstrual flow being retained from the onset of puberty (see p. 67).

Lastly, if the cells or ducts develop true to sex but not completely, the ovaries, Fallopian tubes, uterus or vagina may be very small and unable to perform their functions.

GYNÆCOLOGICAL NURSING.

PART 5.

THE BEARING OF A STATE REGISTERED NURSE.

A FULLY-trained nurse, that is a nurse who is on the general part of the State Register, is one who has developed and brought to a fine art the care and management of the sick, having a sympathetic and intelligent grasp of the theory and practice of nursing. In my opinion the training of such a nurse is not complete until she is on the Roll of the Central Midwives Board.

To become a fully trained nurse she (or he) must have spent at least 3 years in a recognized training-school at which all her faculties should have been exercised to the perfecting of each detail of her work, in no way overlooking the fact that this training is useless unless her character has developed along sound and strong lines, and she has cheerfully responded to the stern discipline which alone can make productive those qualities which are essential to her calling. Taking character as the foundation of a good nurse, an implicit and unquestioning obedience to all instructions received from those in authority is required together with absolute loyalty, a wise energy, and a forgetfulness of self in the love of the work she has undertaken.

Such a nurse will perform her duties with a freedom from self-consciousness and a quiet reserve which cannot fail to elicit the respect of those with whom and for whom she works, and in so doing will uphold the status of the profession she represents.

Manners are often overlooked in a nurse's training, due probably to the rush of her work, and she may be in danger

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of losing the confidence of her patient through an appearance of hurry which must, therefore, be wholly foreign to her nature.

Towards patients and strangers alike, a nurse should be at all times courteous, sympathetic, and helpful, but in every way free from familiarity.

The essential qualities then of a fully-trained nurse are sympathy apart from sentimentality ; an intimate knowledge of all the details of her work which will serve to inspire confidence in patients and doctors alike ; a cheerful self-forgetfulness, holding sacred any information confided to her by doctor or patient, ever avoiding all conversation of a personal nature ; and lastly, accuracy and minute attention to detail. These latter qualities a nurse only acquires in her probationer days, when her habits are being formed and her powers of observation developed by the routine ward-work, for only by such work can she become alert, quick, and have gained that observant and practised eye by which all details of a sick-room and all wants of a doctor are grasped without effort.

The natural outcome of such attributes will be punctuality, neatness, quietness, cleanliness even to the minutest detail, method, and order.

All this is but an outline of what might almost be described as a limitless subject, on the bearing of a nurse towards her patients, doctors, fellow-workers, and the public at large.

CHAPTER XXI.

METHODS OF STERILIZATION.

A wound should never be touched with anything which has not been sterilized, be it india-rubber gloved hands, instruments, ligatures, towels or dressings, neither should any of these objects, once sterilized for use, be allowed to touch anything which has not been sterilized during their use, nor should the risk be incurred of droplet infection.

STERILIZATION can be effected by means of heat or chemicals.

Heat.—

Heat may be used either in the form of dry heat or moist heat, the latter being employed in the form of water or of steam.

Baking.—Dry heat at a temperature of 150° C. will kill spore-forming bacteria if exposed to it for an hour. Its application for this object has, however, the disadvantage that heat penetrates badly, and so bacteria in the middle of an article may escape destruction. For gynæcological purposes this method is not a useful one, since the oven will take small articles only, and cotton, linen, and flannel goods will be scorched.

Boiling.—For articles which can be used directly after being boiled this is the most convenient method of sterilization. Instruments, silk, thread or silkworm gut ligatures and sutures, and india-rubber gloves are usually so treated, while towels and swabs can be if steam is not available. The silk sutures and ligatures should be boiled for 45 minutes and silkworm gut 30 minutes, the remaining articles, except the catgut sutures and ligatures, for at least 20 minutes. As a precaution against the catgut being contaminated by the tetanus bacillus, sutures and ligatures of this material should

be procured already sterilized from a firm recognized by the Ministry of Health.

Steaming.—Steam under pressure is the best method for sterilizing towels, dressings, swabs, operating-gowns, masks, and such-like articles. Bedding and clothing are also most efficiently sterilized by this method. Leather, felt, skins, and macintoshes cannot be steamed.

India-rubber gloves can be sterilized by steam. The method is entirely efficient but very extravagant since the rubber perishes quickly, and in many cases the gloves can be used once only. The *only* advantage of this method of sterilizing gloves is that they are easier for the surgeon to put on and, perhaps, rather more comfortable to wear, a high price to pay for such trifling objects.

Gloves can be efficiently sterilized, when on the hands, by being thoroughly scrubbed with soap and hot water. After the soap and water has been rinsed off the gloved hands are soaked in a mercurial or dettol solution.

An efficient method of sterilizing dishes, trays, and such articles which will not be injured thereby, is to pour into or over them a small quantity of methylated spirit. The spirit is then set alight and allowed to burn itself out.

Chemical.—Too much reliance must not be placed upon the action of chemical substances as sterilizers, since when used of a strength which can be employed in antiseptic surgery, they may not kill, within reasonable time, the more resistant forms of even non-sporing bacteria. The following chemicals are generally used for sterilizing purposes :—

Mercury. Dettol. Carbolic acid in some hospitals.

Mercury.—This is used in the form of its salts, the perchloride or biniodide. Perchloride and biniodide of mercury are very poisonous. A solution of these salts is more or less useless in the presence of albumin forming with it an insoluble compound. Since albumin is contained in blood and other discharges from a wound, these substances must be washed away before the solution of mercury can kill the bacteria. For a similar reason soap must not be allowed to contaminate the mercurial solution. Perchloride of mercury corrodes metal and is the source of great irritation to the hands of some people.

Mercury is the strongest chemical suitable for the purpose of sterilization, but care must be taken in its use and, owing to its poisonous nature, its solutions must be prepared with the greatest care.

If a patient is poisoned with any preparation of mercury she will complain of a metallic taste, sore gums, colic, and nausea. She will suffer from salivation and diarrhœa. Her breath may be very offensive, and there may be blood in her motions. In severe cases the pulse is small and its rate rapid ; the patient has an anxious expression, her skin is cold and clammy, and she may have suppression of urine.

For the catheter, douche-nozzle, vulva, and hands a solution of biniodide or perchloride of mercury, 1 in 2000, may be used. For the vagina and uterus a strength of 1 in 4000 is sufficient. Doctors who prescribe mercurial douches generally order a douche of saline to be given after an intra-uterine or vaginal douche of mercury, to avoid the possibility of poisoning.

Carbolic Acid.—Carbolic acid is an uncertain chemical for sterilizing purposes unless it is used at such a strength that it will injure the tissues. It is, however, a good disinfectant. It has the advantage of not injuring the instruments or combining with albumin, so that it can be used in the presence of that substance. The first sign of carbolic acid poisoning is that the urine becomes green or greenish-black.

Carbolic acid is very useful for sterilizing macintoshes, dishes, and porringers, for which purposes its strength should be 1 in 20 (1 ounce in 19 ounces of water). For the skin, instruments, and hands 1 in 40 is strong enough.

Solutions of carbolic acid are now but seldom used for the surgeon's hands. If, however, the nurse is directed to prepare such a solution she must be careful to mix thoroughly the acid with the water, otherwise the former sinks to the bottom of the bowl and the hands of the surgeon are burnt, which will lead to intensive recriminations.

Dettol is stated to be non-poisonous when used for antiseptic purposes. It belongs to the carbolic acid group of chemicals and its germicidal properties have been proved to be greater than any preparations of a similar character. It

is now extensively used in midwifery. It can be used pure on the skin so long as none of the solution is allowed to remain on the surface after swabbing, but when swabbing the vulva care must be taken that none of the solution trickles down onto the buttocks or thighs since severe burns may be caused thereby. For hands the strength generally used is 1 ounce to 19 ounces of water. For swabs, douches, and skin $\frac{1}{2}$ ounce to $19\frac{1}{2}$ ounces of water.

The nurse must remember to prepare the solutions for douching in strict accordance with the doctor's orders, both as regards the strength of the solution and its temperature. In addition, when she is giving a vaginal douche she must be sure that none of it is retained ; to this end, therefore, after the douche-nozzle is withdrawn she should pull back the perineum and press upon the abdomen.

One of the most important lessons a nurse has to learn is that of surgical cleanliness. A thorough knowledge of the conditions of asepsis and antisepsis will certainly help but she must be able to carry into practice what she has learnt in theory. One has often seen a nurse, whose theoretical knowledge of the principles of surgical cleanliness has been quite sufficient, fail lamentably in this respect through lack of care and strict routine when it came to practise. Thus a nurse will sterilize all the instruments and appliances, will dress herself in a sterilized overall, will scrub her hands and soak them in an antiseptic afterwards, and will then proceed to touch some object which has not been sterilized, be it the mask, the patient, a piece of furniture, or even her cap ! after which she may, unless admonished, continue to help at the operation without again rendering her gloved hands as aseptic as possible.

A nurse must remember when assisting with the instruments or swabs at the operation that, after having once rendered her hands and forearms as aseptic as possible, she must not touch anything that has not been sterilized till the operation is finished. Very rarely with insufficient assistance this may be impossible, in which case the nurse must again prepare her hands, and she must wash the india-rubber gloves thoroughly in mercury solution or put on another pair.

How to Disinfect a Room.

The disinfection should be carried out as follows with any additional help that is necessary :—

The windows and fireplace should be pasted up with brown paper so as to prevent any air from entering the room. The blankets, mattress, and bolsters should be spread out, and all the drawers and cupboards should be opened so that their contents are exposed as much as possible.

A formalin lamp (which can be hired at a moderate charge from most chemists) should be placed in the centre of the room, and after the lamp is lit the room should be left as quickly as possible, the door closed, and the keyhole and the junction of the door with its frame pasted over with strips of brown paper.

At the end of 12 hours the door, windows, and fireplace should be opened and the room exposed to the fresh air for some time.

The woodwork of the room and the furniture should be thoroughly scrubbed with soap and water. If the walls are papered it is better that they should be stripped and afterwards washed with some disinfectant. If distempered or painted the walls should be sprayed with formalin and then washed down.

Books and papers used in the room should be burnt as they cannot be disinfected unless exposed to a degree of heat which would spoil them.

If a formalin lamp cannot be obtained, the room can be less efficiently disinfected with rock sulphur. Three pounds of this should be placed on a shovel with some red-hot cinders, the whole being placed over a bath of water, so that if any cinders should fall there would be no danger of fire. Sulphur candles are sold for disinfecting purposes.

Blankets should be stoved before being sent to the laundry. The Borough Council will undertake such sterilization.

All the linen which can be boiled should be placed in a solution of carbolic acid 1 in 20, then removed from the room and sent to the laundry.

SULPHANILAMIDE.

The following, although it has no connexion with methods of sterilization, may be of interest to nurses.

This chemical was obtained from Prontosil, a proprietary compound (to give it its chemical name, the azodye hydrochloride of di-amino-azobenzine of sulphonamide). The action of Prontosil was mainly due to the sulphonamide, the naphthalene dye being combined to make it more soluble.

As a result of investigations by bacteriologists and chemists it was discovered that the dye could be eliminated, and the chemical substance was then termed sulphanilamide (a non-proprietary name). Further investigation proved that there were compounds of sulphanilamide which, with the same intensive action on certain bacteria, were less dangerous to the patient.

The most important of these compounds is termed sulpha-pyridine which has led to such a striking success in the treatment of puerperal sepsis, pneumonia, cerebro-spinal meningitis, gonorrhœa and other infections due to the hæmolytic streptococcus. Another compound termed sulpha-thiazole has been used with some success in staphylococcal infections. Lastly, compounds of sulphanilamide are used, locally, as powders for wounds.

CHAPTER XXII.

POSITION OF THE PATIENT FOR EXAMINATION OR OPERATION.

THE nurse, without any delay, should be able to place the patient in any position which the doctor requires. It is very irritating to a doctor to discover, either that the nurse does not know what he means when he directs her to place the patient in a certain position or, if she does, that she is not capable of carrying out his directions. Nevertheless, it is not at all uncommon when operating in the house of a patient, and even in a Nursing Home, to find the nurse ignorant of such things, and an interrogation may elicit the fact that such ignorance is more often due to the nurse not having been trained in this respect (when she was in hospital) than to forgetfulness.

For Examination and Treatment.

Recumbent Position.—Doctors examine their patients, when consulted for symptoms of an obstetrical or of a gynæcological nature, by a routine method. First an examination of the breasts and abdomen is made, then an examination of the vulva, and lastly, if necessary, an examination of the vagina, uterus, ovaries, and Fallopian tubes.

The recumbent position is, therefore, the first to be assumed by the patient when an examination is necessary.

In this position the patient lies on her back with her head and shoulders supported by a pillow. If in bed her nightgown should be drawn up so far as the breasts, and the lower part of her body should be covered with the sheet only, which should be drawn down so that it just hides the pubic hairs.

Many nurses, when asked to get ready a patient for examination in the recumbent position, turn down the sheet, blankets, and bed-cover or quilt in one piece.

If the patient is not in bed she should remove her skirt, and corsets if any, after which the strings of her petticoat should

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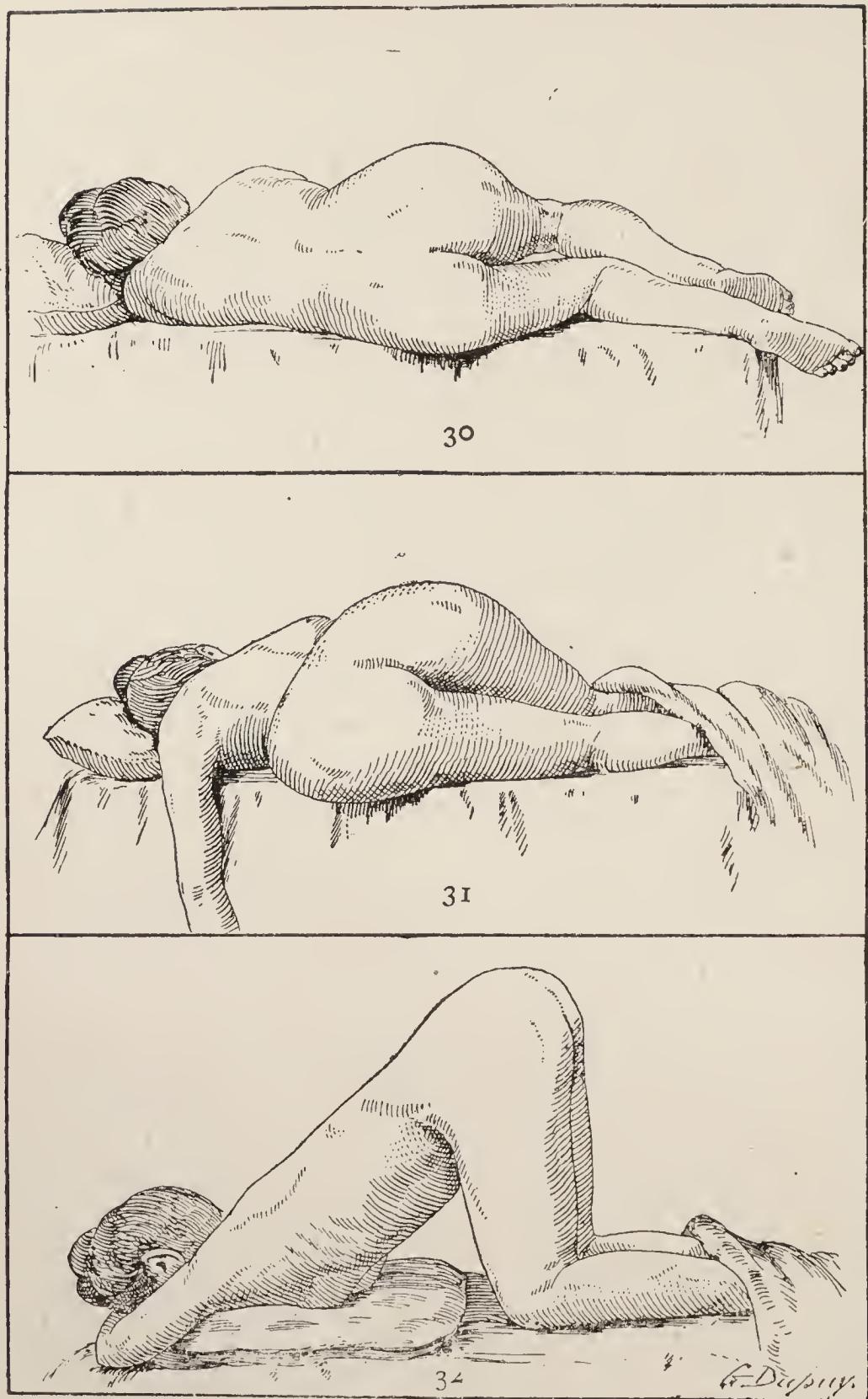
FIG. 30.—Left Lateral Position. FIG. 31.—Sims's Semi-prone
Position. FIG. 32.—Knee-pectoral Position.

be loosened so that it can be pushed down together with her knickers, till the abdomen is bared, or if combinations are worn these should be unbuttoned or removed.

Left Lateral Position.—In this position the patient lies on her left side, her head on a pillow with her knees drawn well up towards her chin, and her back somewhat arched. Her buttocks should be lifted over the edge of the bed and the sheet should be arranged so that it can be drawn up easily so as to expose the vulva (Fig. 30). As a matter of experience one finds that many nurses fail to lift the buttocks of the patient well over the edge of the bed, when placing her
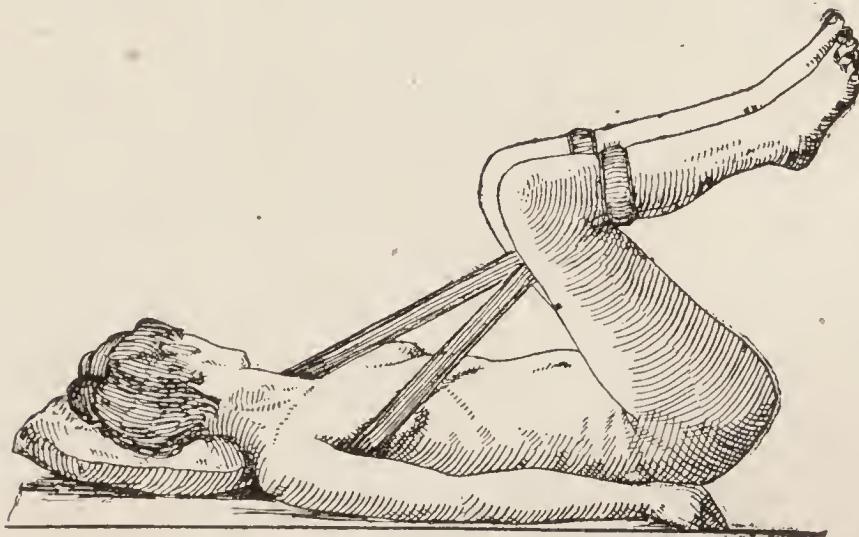
FIG. 33.—LITHOTOMY POSITION WHEN AN EFFICIENT OPERATING TABLE IS NOT AVAILABLE. Note that the cross-bar of Clover's crutch is applied below the knees, and the strap is over one shoulder and below the other.

in the left lateral position. The patient is placed on the left side because most doctors are right-handed.

In this position the vulva can be well inspected, a bi-manual examination can be made, pessaries can be inserted, and minor treatment to the vagina or cervix carried out.

Semi-prone Position.—The semi-prone position was first used by an American gynæcologist named Marion Sims, and is, therefore, often called after his name. On the patient assuming such a position, if the doctor separates the labia the air enters the vagina and distends the vaginal walls, and by this means, and with the aid of the duck-bill (Sims's) speculum, the vaginal walls and cervix can be efficiently examined

(Fig. 31). It is also a good position when replacing an incarce-rated retroverted gravid uterus.
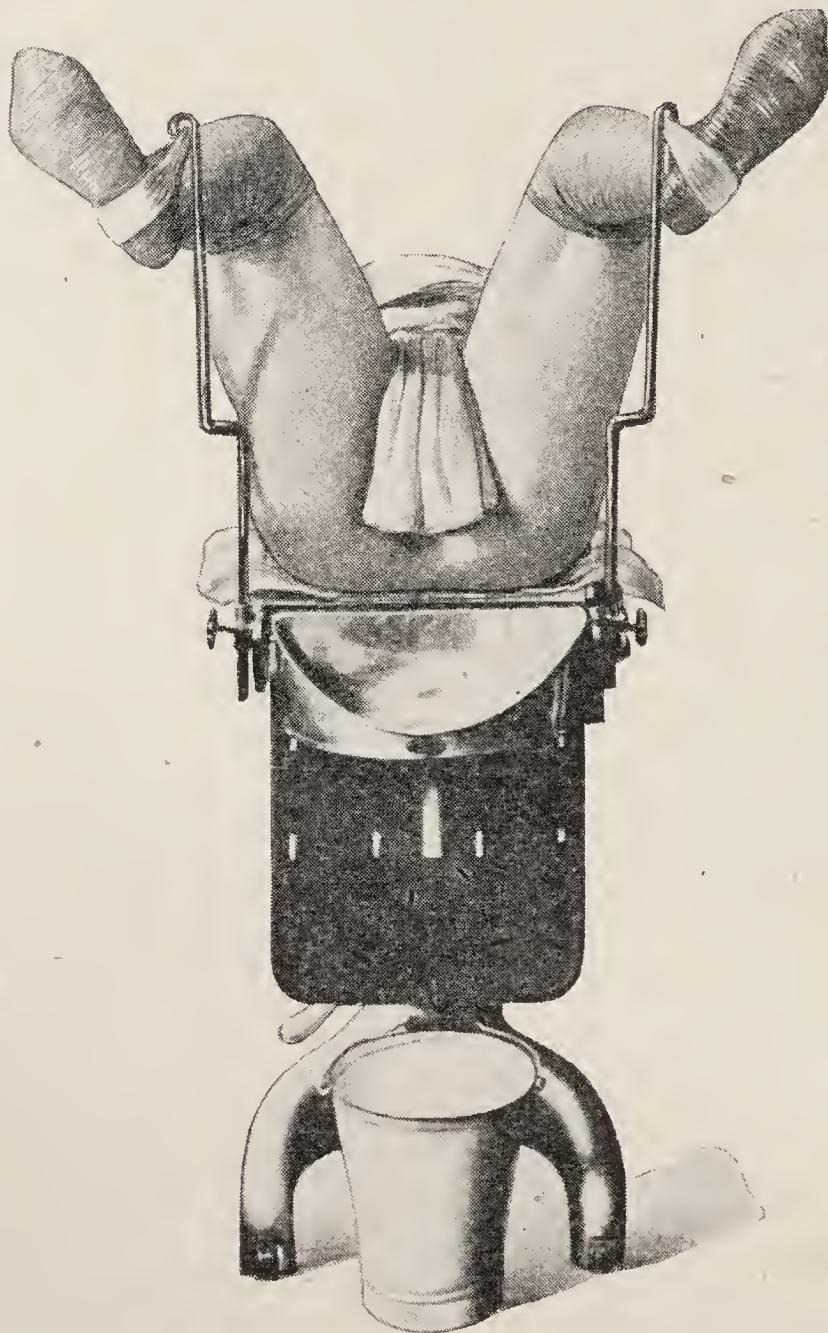
FIG. 34.—LITHOTOMY POSITION ON AN EFFICIENT OPERATING TABLE.

To show the positions more plåinly the sterilized coverings for the feet, legs, and perineum have been omitted.

(*Allen & Hanburys' St. Bartholomew's operating table.*)

The patient lies well over on her left side with her face and breasts on the pillow, her left arm hanging behind her
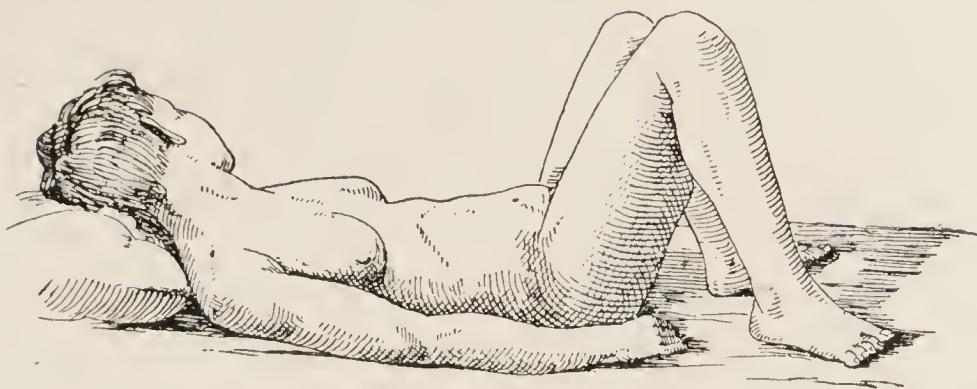
FIG. 35.—DORSAL POSITION.
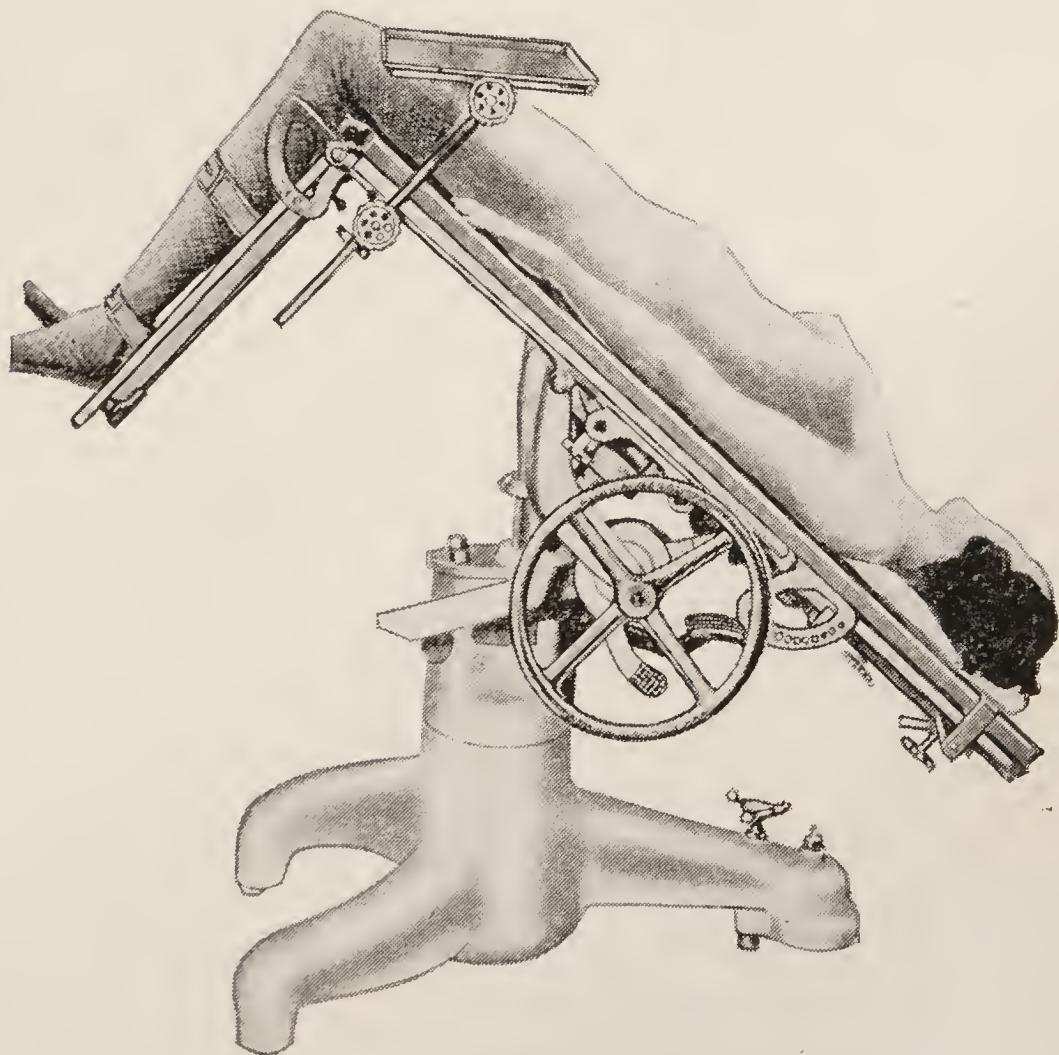
FIG. 36.—TRENDELENBURG POSITION.

To show the position more clearly the sterilized body-sheet has been omitted.

(*Allen & Hanburys' St. Bartholomew's operating table.*)

over the edge of the bed or couch, while her pelvis and thighs are kept in the left lateral position, the right thigh being flexed somewhat more than the left.

Knee-pectoral Position.—This position, when the labia are separated, causes the air to enter the vagina and distend it to its greatest limits. Advantage is taken of this pressure, and also of the fact that the viscera tend, in this position, to fall away from the pelvis, when the doctor is endeavouring to replace an incarcerated retroverted gravid uterus, or a tumour impacted in the pelvis.

The patient is placed so that she kneels on the bed or couch, her thighs being in a vertical position and her feet projecting over the edge of the couch. At the same time her breasts rest on a pillow, and her face is turned to one side (Fig. 32).

Dorsal Position.—In this position the patient lies on her back with her knees well drawn up and separated. Some doctors prefer to make a bimanual examination with the patient in this position. The doctor stands either at the right side of the patient, or between her legs if the patient is placed across the bed or brought to the end of the couch with the buttocks overhanging.

In this latter case the legs must be held in position or the feet rested on extension brackets if the couch is fitted with these. The patient's head and shoulders should rest on a pillow, her nightgown must be drawn up under her buttocks, and her knees should be covered with a sheet or shawl (Fig. 35). The advantage of this position is that an examination can be made with the pelvic organs more or less in their natural position, and, if the doctor stands between the legs of the patient, a very complete examination can be made of the vulva, while treatment to the vagina or cervix can be easily applied. This is also the best position for passing the catheter, in which case the sheet should be drawn up above the pubes.

One of the most useful positions for the bimanual examination, and one which does not expose the patient to such an extent as that last described, is for the patient to lie with the upper half of her body in the recumbent position and with

her pelvis and thighs in the left lateral position, or as near to this as she is able.

For Minor and Major Operations.

Recumbent Position.—In this position the patient lies flat on the operating table ; it is used for abdominal operations when the Trendelenburg position is not required.

Lithotomy Position.—In this position the patient is placed in the dorsal position, and her buttocks are drawn well over the end of the table. The thighs are then flexed on the trunk and the legs on the thighs. If the patient is kept in this position by means of a Clover's crutch, the nurse must remember that *the cross-bar is strapped to the legs below the knee, and not to the thighs above the knee and that the strap goes over one shoulder and under the other*. It does not matter how experienced a nurse may be, she may even have been a Theatre Sister, but, in many cases, when she takes up private nursing she will apply this cross-bar incorrectly. If an operating table is being used it will have uprights at its end to which the *ankles should be strapped and not the knees* (Fig. 34). A common mistake for the nurse to make is not to draw the buttocks of the patient far enough over the edge of the table.

When the patient is once in the lithotomy position the nurse must be very careful to steady her, otherwise the patient may, when thus unattended, fall off the table onto the floor in a trussed-up condition. This accident once happened in the experience of the author, the patient was completely ' knocked out,' and it was thought, for the moment, that she was dead.

Trendelenburg Position.—The Trendelenburg position, named after the surgeon who suggested it, is the position in which the patient is most often placed for an abdominal operation on the pelvic organs. Its great advantage is that the intestines and omentum fall back towards the diaphragm, leaving the pelvis free and exposing the pelvic organs (Fig. 36). The patient is so tilted that her knees are the highest point and her head is the lowest. This position to be perfect requires an operating table that is made to tilt especially for this purpose. *While the patient is being tilted into this position, a nurse must*

press the feet back so that the legs are at right angles to the thighs, otherwise the patient will slip down the table, perhaps on to the lap of the anæsthetist. This apparently small point is of more importance than most nurses working in private, or in Nursing Homes, appear to think, for the patient having slipped down, the table has to be lowered and the whole process repeated ; a waste of time, energy, and most irritating to the surgeon. When the requisite tilt has been obtained, the ankles are secured to the frame of the table with bandages. The best operating tables have movable end-pieces to which the ankles can be secured before the table is tilted so that the legs need not be held at right angles. A modified Trendelenburg may be obtained, in the absence of a proper operating table, by resting the back of the patient against a chair turned upside down, allowing her legs to hang over the rail below the seat.

After Operation.

Minor Operations.—Following a minor operation the exact position of the patient in bed does not in most cases signify, though after perineorrhaphy the patient will be more comfortable on her side owing to the swelling and tenderness at the site of the operation, unless a ring air cushion is available.

Major Operations.—When the patient is first returned to bed she should be placed upon her back, her legs should be raised, and her knees kept flexed by means of a pillow placed under them. In this way strain on the abdominal muscles is prevented. A pillow should also be placed under the small of the back which needs support.

After the shock of the operation has subsided the patient, if she wishes, may be turned on her side and kept in that position by pillows placed under her shoulder and legs.

Fowler's Position.—In this position the patient is propped up in a sitting posture by means of a bed-rest or pillows. To keep her from slipping down into the bed a bolster rolled in a draw-sheet with long ends is placed under her knees. To keep this bolster in position, bandages are tied to the long ends of the draw-sheet and to the head of the bed on each side.
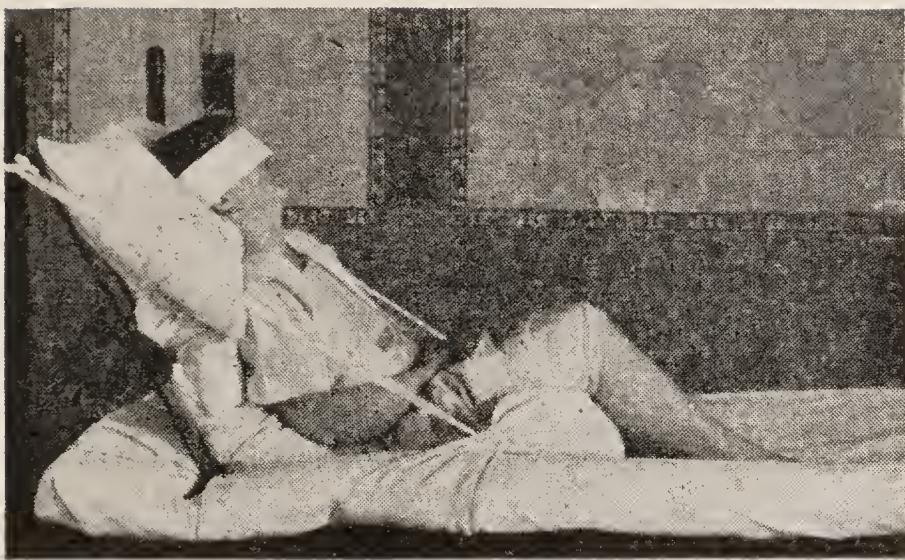
FIG. 37.—FOWLER'S POSITION.

When this is not necessary, owing to the bed having an ad-justable bed-rest, the ends of the sheet are securely tucked under the mattress at each side. If the patient is heavy and the bolster tends to buckle up, a broom-stick wrapped round with a blanket and draw-sheet will be found a most efficient substitute (Fig. 37).

Fowler's position is the best for the patient to assume after an abdominal operation. It relieves the backache, diminishes the tendency to flatulence and sickness, and en-courages sleep and drainage from the vagina.

If abdominal drainage has been employed this position also allows the fluid to escape more easily through the tubes.

After Spinal Anæsthesia.—The patient should be re-turned to the ward on the ambulance in a modified Trendelen-burg position by means of a wooden apparatus. After the patient has been transferred to her bed, the front legs of the bed should be rested on the seats of two chairs for 4 hours. For the next 4 hours the front legs are rested on blocks 12 inches high, for the next 4 hours on blocks 6 inches high, after which the bed is placed in its usual position and two pillows are put under the head of the patient. By precau-tions such as these it is found that the very severe headache, which otherwise may last for days after a spinal injection, is practically abolished.

If the patient is very anæmic she must be kept quiet and must not be allowed to exert herself in any way.

CHAPTER XXIII.

VAGINAL EXAMINATION, DOUCHING AND TAMPON-
ADING. CATHETERIZATION. WASHING OUT THE
BLADDER. RECTAL EXAMINATION.

VAGINAL EXAMINATION.

THE doctor will require the following articles assembled on
a table :—

Sterilized gloves, 2 bowls for antiseptic swabs, sterilized
lubricant and ring forceps, and may require an uterine sound
and a Sims' or Ferguson's speculum. The instruments
should be sterilized. The clothes of the patient, or bed-
clothes, having been suitably arranged, the examination is
made with the patient in the left lateral position, or on her
back with her thighs and legs flexed. In either case the nurse
must draw the buttocks of the patient *well over* the edge of
the bed or table.

VAGINAL DOUCHING.

Vaginal douching, unless employed in suitable cases, does
more harm than good. The normal secretion of the vagina is
acid in reaction and this has a deleterious effect on most septic
and pathogenic bacteria.

Nature never intended the vagina to be douched, and to
wash away its secretion only encourages the growth of bacteria,
more especially if the solution used is an alkaline one. More-
over, since vaginal douching causes a certain amount of con-
gestion, if persisted in for any length of time, it increases the
secretion of the genital organs, tends to make the period more
profuse and is, in some cases, the cause of dysmenorrhœa and
pelvic pain. It is a matter of everyday observation that so

long as a woman continues to use a vaginal douche, her leucorrhœa persists.

Vaginal douching is most commonly used by women for leucorrhœa, and this without the advice of a doctor. When it is remembered that in most cases of leucorrhœa the discharge comes from the lining membrane of the uterus, and that the solution used in a vaginal douche cannot possibly enter the uterus, unless the cervix is dilated, it is manifest that the only result of vaginal douching, apart from any harm it may do, is in most cases to wash away the discharge that has collected in the vagina. The amount of leucorrhœa will undoubtedly appear to the woman to be less for the time being, but the other symptoms she often complains of may rather tend to get worse.

Vaginal douching is not required, as a rule, after plastic operations on the vulva and vagina. The patients are found to do better if treated by the dry method. In spite of every precaution, however, the wound may become infected and there is an offensive vaginal discharge. If an antiseptic douche is ordered the nurse should use a piece of rubber tubing for the douche nozzle—a full-size rubber catheter will do very well. If the glass or vulcanite douche nozzle is used *there is danger of the nurse forcing the end of the nozzle between the sutured edges of the wound, and so seriously interfering with the success of the operation.* This accident has often happened.

If a woman has a gonorrhœal infection of her vulva, a vaginal douche may be the means of conveying the gono-coccus to the vagina or uterus and so to the Fallopian tubes, ovaries, and peritoneum. Again, after the uterus has been curetted, vaginal douching may lead to its infection, and this is perhaps why the result of this operation is so often dis-appointing.

Vaginal douching daily is necessary for cleansing purposes when a pessary has been inserted. They are also used when the discharge is offensive—associated with cancer, sloughing fibroid polypi, ulceration of the vagina or vulva, or after internal manipulation during childbirth.

Uterine and vaginal hæmorrhage is rightly treated with hot vaginal douches, but the douche must be hot and not

warm. Pelvic inflammation, such as pelvic peritonitis and pelvic cellulitis, can in many cases with advantage be treated by hot douches.

The Administration of Vaginal Douches.

The following articles are required : a douche-can, a douche-pan, a bath thermometer, a measure, sterile lubricant, 2 bowls for swabs, a jug for the douche, and india-rubber gloves.

The douche-can should hold 2 quarts, should have 6 feet of tubing attached to it, a glass nozzle, and a tap near the nozzle, so that the nurse, or patient if she is giving the douche herself, can stop the flow.

As a rule only 2 quarts of fluid are used at a time, which take about 5 minutes to run through, and the douche-pan should hold this quantity. If, however, for some reason the doctor wishes the patient to be douched longer, say for 15 or 20 minutes, then, in addition, a pail will be required to empty the contents of the douche-pan into, or a douche-pan may be obtained to which is affixed a piece of rubber tubing, the free end of which on being put into the pail carries the douche from the douche-pan into the pail, without the patient having to be disturbed.

The temperature for aseptic purposes is 100° F., and that for bleeding or inflammation is 115° F. to 120° F. Most patients can stand a temperature of 106° F. to 110° F., but when the temperature rises above this and the douche runs for any length of time some distress may be caused by the fluid, as it escapes into the douche-pan, burning the inner surfaces of the thighs. This can be greatly modified by smearing the parts involved with vaseline.

The nurse must be most careful *that the antiseptic, if ordered, is of the correct strength and temperature, otherwise the vaginal walls may be injured.* On occasions a nurse may be seen to pour in the antiseptic without having the least idea of what the real strength of the douche will be, while to gauge the temperature she will make a rough guess by inserting her fingers into the fluid.

In most cases it does not matter what antiseptic is used and water alone will be sufficient. To please the patient

bicarbonate of soda 1 drachm to 19 ounces of water can be added.

The solution should always, therefore, be mixed in a separate jug, and its temperature tested before it is emptied into the douche-can. All the appliances for douching should be rendered as aseptic as possible by a thorough washing and boiling. If there is no utensil large enough in which to boil the douche-can, it must be swabbed with carbolic acid 1 in 20. The glass nozzle during the interval of its use should be kept in a solution of carbolic acid 1 in 20.

The douche nozzle should be passed behind the cervix.

Douching on the Back.—All pillows should be removed in order that the pelvis may be suitably tilted, and the patient should lie flat on her back, with her legs drawn up and separated, her pelvis resting on the douche-pan which has been warmed. A macintosh is placed under the douche-pan, and the bed-clothes are drawn up. The nurse, having placed the douche-can in a convenient place and raised above the level of the patient, next thoroughly washes her hands, puts on the sterilized gloves, cleans the vulva with biniodide of mercury 1 in 2000, or dettol ½ ounce to the pint, and then separating the labia with her left fingers pushes the nozzle into the vagina with her right hand. The tap on the tube being turned the douche flows into the vagina and out again into the douche-pan.

Douching on the Side.—The patient is placed in the left lateral position with her buttocks drawn well over the edge of the bed, the knees flexed, the right beyond the left, and both raised at an angle from the bed by a pillow which slopes to the lower hip. A thick pad must be placed between the thighs, the upper end against the pubes to prevent a backward flow of fluid along the groin. The bed-clothing should be sufficiently folded back to leave exposed the vulva and outer border of the buttocks.

A warmed macintosh with a rolled-in border, to form a ridge of protection, is placed under the hip, so that it slightly lodges on the end of the knee-pillow and is well grouped over the edge of the bed to form a gutter into a pail which has been placed on the floor beneath the buttocks. Sterile towels can then be arranged round the parts as desired.

A copious douche can thus be given without disturbing

the patient, or in any way soiling the bed, and the parts are clearly available for such treatment as plugging the vagina. The parts exposed should be dried thoroughly after the douche has been given.

After the douche has been given, in either position, the patient, if able to, should sit up for any fluid left to escape from the vagina.

The antiseptics generally used are tincture of iodine ʒi to a pint, perchloride of mercury 1 in 4000, or dettol 1 in 20.

Vaginal Tampons, Packing the Vagina.

Vaginal tampons are of two varieties. Dry when used for packing the vagina in cases of hæmorrhage from the uterus or vagina. Wet soaked in some chemical for inflammatory conditions of the vagina, uterus, Fallopian tubes, ovaries, pelvic cellular tissue, or pelvic peritoneum.

One method of making a tampon is to take a piece of absorbent wool 12 inches long and 5 inches broad, and to sew a piece of tape to one end. The solution which is generally used is one of ichthyol 5 to 10 per cent, and is poured over this strip of wool and allowed to soak thoroughly into it, the wool is then twisted up like a rope and is ready for use.

Another form of tampon is the kite-tail. Make several small tampons composed of absorbent wool wrung out in an antiseptic solution, about the size and shape of a hen's egg, or perhaps a little smaller; these are attached to a piece of silk or tape so that there is about 4 inches of tape between each piece of wool.

When inserting tampons it is most important to ensure that the whole vagina is carefully packed and everywhere in contact with them.

Tampons may be introduced either by means of a Sims' speculum and swab-forceps or by placing the first and second fingers of the left hand in the vagina, separating the labia a little, and then inserting the tampon with the right hand. The fingers of the left hand are then withdrawn, and the tampon pushed up as far as possible with the first finger of the right hand. The tampons should always be carefully and firmly packed round the cervix, gradually filling up the

vagina from above downwards. Tampons are, as a rule, inserted at night, and removed in the morning, and as the secretion caused by their use is often rather profuse, a diaper should be worn by the patient.

Medicated tampons, which can easily be introduced into the vagina by a nurse who has been properly trained, can also be inserted through a Ferguson's speculum with swab-forceps.

The patient must be in the dorsal position, lying across the bed, and the vagina has to be packed as tightly as possible. Owing to the restlessness of the patient, packing the vagina in cases of hæmorrhage is very difficult for any nurse however skilled. Since this method of arresting bleeding from the genital passage is used only in an emergency, the nurse will have sent for the doctor and must do her best till he arrives.

Before the nurse inserts the tampons the patient should empty her bladder, or the urine should be drawn off by catheter. Especially is this of importance when the vagina is being plugged for hæmorrhage, in which case the gauze must be packed as tightly as possible, and if this is done efficiently the urethra will be compressed and so prevent micturition. Since the plugging must be left in the vagina for several hours, if the bladder contained a fair quantity of urine when the plugging was inserted, the latter would have to be removed sooner than is desirable, in order that the patient might empty her bladder.

It is not easy to insert tampons or packing correctly. In cases of hæmorrhage the nurse will have to do the best she can. In other cases the doctor will probably insert the tampons, unless he has taught the nurse the correct way.

For Hæmorrhage.—In the case of hæmorrhage from the uterus or vagina, the bladder having been emptied, a douche at 120° F. should then be given, and flavine 1 in 1000 is frequently used for this purpose since its action is styptic as well as antiseptic. Plain gauze dipped in biniodide of mercury 1 in 4000, or dettol 1 in 20 is then packed into the vagina. If gauze is not obtainable it is best to use what is known as a kite-tail tampon.

For Inflammatory Conditions.—A vaginal douche should be given both before the tampon is inserted and

after its removal, the vagina being dried very carefully with swabs, and any discharge which may still be clinging to its walls removed, in order that the solution with which the tampon is impregnated may be brought into contact with the inner surface of the vagina.

Catheterization.

The catheter is used to empty the bladder before or during an operation, for retention of urine, to estimate the amount of residual urine, to obtain an uncontaminated specimen of urine for testing purposes, after an operation in which the bladder may have been injured, in some cases of perineorrhaphy and as a preliminary to washing out the bladder and testing its capacity.

Although one of the simplest procedures, catheterization may, if carelessly performed, cause the patient many weeks of misery if bacteria are introduced into the bladder. If this happens, cystitis is set up, and the inflammation may then extend up the ureters to the kidneys with a fatal result, or infecting one kidney so disorganize it that its removal is imperative.

To prevent bacteria being carried into the bladder, the nurse must thoroughly wash and scrub her hands and wear sterilized india-rubber gloves. In the absence of the latter she should soak her hands in a solution of biniodide of mercury 1 in 2000, or dettol 1 in 20; she must be sure that the catheter is sterile and, lastly, that the vulva is swabbed clean.

In some cases, owing to inflammation of the urethra, a malignant growth, or urethral caruncle, the patient may experience acute pain when the catheter is passed. To relieve the pain the doctor may order a few drops of a 10 per cent. solution of cocaine to be injected into the orifice of the urethra with a glass syringe before the catheter is passed.

The best catheter to use is a glass one; if it is impossible to use this because of the risk of breakage on account of some abnormal pressure on the urethra, then a soft rubber catheter should be used. If a glass catheter is to be used it should be wrapped in lint, placed in cold water and kept there till the water boils. After being sterilized it must be placed

in warm dettol solution, otherwise it may crack. The catheter should be well boiled after use, and in the interval it should be kept in dettol. Special care must be taken with the soft rubber catheter to see that the eye is quite patent, and in both a stream of cold water should be passed through after use in order that the channel may be properly sluiced.

If the urethra is normal, pain, as opposed to discomfort, should not be experienced by the patient when the catheter is passed. In such circumstances pain means that the catheter is being passed roughly or in a wrong direction. Especially may there be some little difficulty in passing the catheter, if necessary, after the operation of anterior colporrhaphy, when the direction of the urethra may be somewhat altered. In such cases, in their endeavour to force the catheter into the bladder, and when using a hard catheter, nurses have punctured the floor of the urethra. The result has been a urethro-vaginal fistula, a most difficult injury to cure by operation and leading to great misery of the patient. For this reason in such cases a rubber catheter should be used.

The following articles will be required : 2 sterilized catheters, a porringer to receive the urine, 2 bowls for antiseptic swabs, and sterilized india-rubber gloves.

The nurse having made her hands as aseptic as possible, the vulva is cleaned as follows : The patient being on her back with her legs drawn up and separated, the labia are held apart by the first and second fingers of the left hand, the wrist resting on the pubes, and exposing the vestibule where the urethral canal opens. The vestibule is well swabbed with biniodide of mercury 1 in 2000, or dettol 1 in 20, by which means any bacteria contaminating this area may be removed and the risk of their being carried in by the catheter excluded. The nurse again surgically cleanses her gloved hands and, exposing the vestibule once more with her left fingers, passes the catheter into the urethral orifice with her right hand.

A porringer should be placed between the patient's legs to receive the urine, and the catheter should be held in position with the labia separated until most of the urine has passed. On the stream of urine diminishing and the fluid escaping in drops, the catheter is pulled out a little till the stream recommences to flow. When a second time the drops appear the

bladder is practically empty, and the catheter is withdrawn. The thumb should be kept over the orifice at the free end of the catheter so that any urine remaining in the catheter will not be spilt over the patient or bed-clothes, and the amount which remains in the catheter can then be added to the rest of the urine in case there is any sediment; or the contents of the catheter can be added to a sterile test-tube if the doctor so desires.

The difficulties which may arise when passing a catheter are due to the orifice of the urethra being difficult to find because the parts adjacent to it are swollen or to some tumour preventing the passage of the catheter. The most common fault is for the nurse, especially if she be inexperienced, to fail to recognize the orifice of the urethra and then she passes the catheter into the vagina. If this happens the catheter should again be sterilized before being used, or it is better to prepare two catheters in the first place so that if one is soiled the other is ready for use. To prevent the catheter being passed into the vagina it is a good plan, especially when proba-tioners are first learning to pass a catheter, to place a swab in the vaginal orifice before the instrument is passed. If the catheter has been used for a septic case it is much safer not to use it for any other.

It occasionally happens that when the abdomen has been opened the bladder is so distended with urine that it gets in the way of the gynæcologist as he is starting to remove the uterus. The reason the bladder is thus distended may be that the nurse did not draw off all the urine prior to the operation, that the patient was left waiting for the operation longer than usual after her bladder had been emptied, or because of a tumour, for instance a cervical fibroid, the nurse could not pass the catheter so easily as she is ac-customed to. *In the latter circumstance, it is the duty of the nurse to inform the operator of her difficulty.* In fact, most careful gynæcologists before commencing any abdominal operation will ask the nurse in every case, whether there has been any difficulty in drawing off the urine. The reason for such a question is that if the operator is ignorant of the fact that the bladder may be distended, he may un-fortunately wound it when opening the peritoneal cavity.

The nurse also would do well to remember that, if the bladder is found to be distended when the abdomen has been opened, she may be called upon to pass the catheter. Nothing is more pathetic than to see a nurse, whose duty it really is to pass catheters on females when necessary, fail ignominiously because the patient may not be in the exact position in which the nurse has generally passed the catheter, or because the nurse is ignorant of the relations of the urethral orifice.

Washing Out the Bladder.

The nurse may be directed to wash out the bladder in certain cases of cystitis.

The following articles are required for washing out the bladder : A glass funnel to which is attached 4 feet of india-rubber tubing, two glass catheters with a small piece of rubber tubing, and a glass joint to which can be attached the tube and funnel. A kidney tray to receive the urine, a porringer for receiving the return flow from the bladder, and a jug and thermometer for the solution, 4 to 6 pints of boric-acid solution. The apparatus should be sterilized, and then placed ready on a table by the side of the patient.

Before washing out the bladder its capacity should be gauged.

Method of Gauging the Capacity of the Bladder.— After the catheter has been passed and the urine evacuated, the first catheter should be withdrawn and the second catheter with the tubing and glass funnel attached, which have been filled with the sterile lotion to exclude air, is then inserted. This method is much more comfortable for the patient than attaching the tubing to the first catheter inserted since, unless the nurse is very expert and careful, the catheter will be moved unduly while the tubing is being affixed. The tubing is pinched below the funnel which is then emptied, after which the funnel is filled with the prescribed lotion and the fingers are removed from the tube. The solution is poured in slowly till it begins to rise back in the funnel, showing the bladder is full. Normally the bladder will take 8 to 10 ounces of the solution before the latter commences to return. The tubing is at once pinched, the funnel lowered into a measured porringer, and the tubing unpinched,

when the contents of the bladder will siphon out and can then be measured, indicating the capacity of the bladder.

To Wash Out the Bladder.—The bladder should be washed out with repeated amounts of the boric-acid solution, one ounce less in quantity than the proved capacity of the bladder. After the solution has remained in the bladder a short time the funnel is lowered below the level of the top of
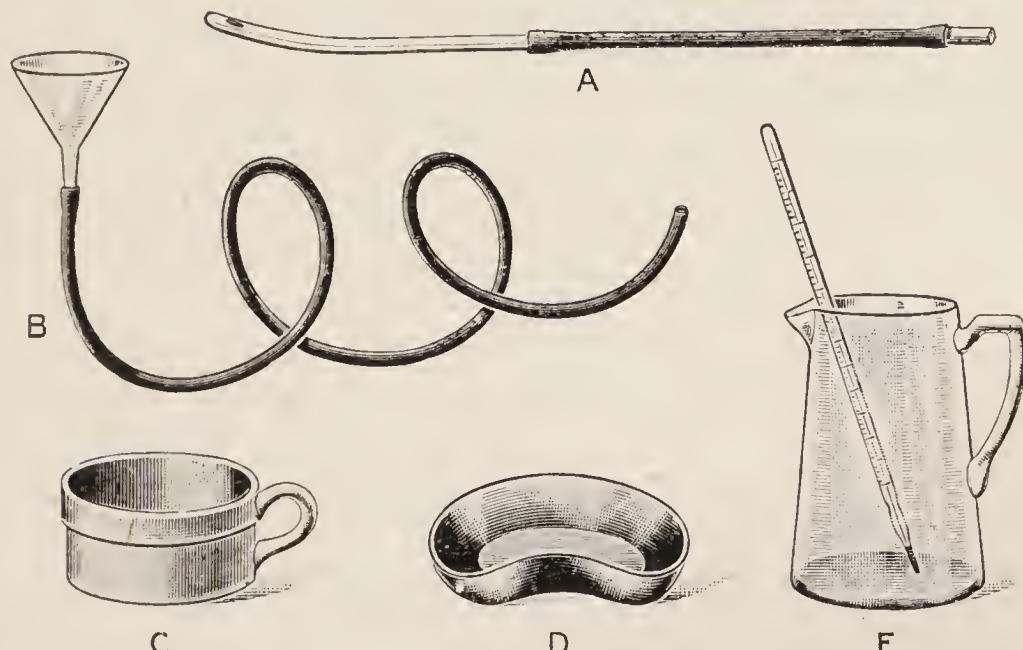
FIG. 38.—ARTICLES FOR WASHING OUT THE BLADDER.

    A.   Glass catheter, rubber tubing and glass joint.
    B.   Glass funnel and rubber tubing.
    C.   Porringer for swabs.
    D.   Kidney tray, urine.
    E.   Glass or enamel measure and thermometer.

the operating table or that of the bed, and the solution allowed to run out. This is repeated until at least 2 pints of the solution have been used, the bladder being washed out twice daily until the cystitis is relieved. The temperature of the solution to be used should be between 100° F. and 105° F. The nurse must be most careful to ensure that the temperature of the solution is not above 105° F. It has happened that a

nurse, carelessly ignoring this point, has used a solution so hot that the bladder has been terribly scalded, resulting in a vesico-vaginal fistula, or causing incontinence and invalidism for many months, and necessitating serious operations in an endeavour to cure the injuries.

Rectal Examination.—The doctor will require the following articles :—

Sterilized rubber gloves, 2 bowls for antiseptic swabs, sterilized lubricant, and may require a rectal speculum.

It not infrequently happens that a doctor, after making a vaginal examination, wishes to make a rectal examination. If, therefore, a nurse adds to the articles she has prepared for a vaginal examination a rectal speculum, the doctor will not have to wait while the latter is being fetched should he require one.

CHAPTER XXIV.

PRE-OPERATIVE EXAMINATION AND PREPARATION OF THE PATIENT.

Rest.—*Vaginal operations.*—In most cases if the patient remains in bed for 12 hours before the operation this will suffice. This period of rest may have to be extended if, in certain diseases, the parts require some days to render them as aseptic as possible.

Abdominal operations.—In the majority of cases the patient goes to bed in the afternoon before the operation. In those patients in whom the nervous system is unduly disturbed by the thought of the operation a rest in bed for a few days would undoubtedly be advantageous.

Lastly, patients suffering from cardiac, pulmonary, or renal disease, or from the effects of uterine hæmorrhage, may, when an operation is indicated, require a longer rest than this.

Since before an operation patients are, naturally, apt to be nervous and apprehensive, some surgeons prescribe a sleeping draught for a night or two before the operation.

Pulse.—The rate and character of the pulse should have been noted as long as possible before the operation, and its frequency charted regularly morning and evening. Such a procedure is most important. Some nurses are apt to be careless in not charting the pulse-rate before the operation, and it may be that during this time the rate has been above or below normal. Following the operation a similar rate continuing, the operator may be puzzled as to its cause when after all it may be the normal for that particular patient.

Respiration Rate.—This should be charted, and if the patient is troubled by a cough this should be reported to the doctor.

Temperature.—This should be charted morning and evening unless the doctor orders this to be done more frequently.

The same remark applies, as to the importance of recording the respiration rate and temperature before the operation, as to that of recording the pulse-rate.

Mouth.—The patient should clean her teeth at least twice daily, using some efficient mouth-wash such as glycothymoline or peroxide of hydrogen, and if she is too weak to do this the nurse must do so for her with dabs of wool soaked in the mouth-wash and held by forceps. Cases of septic pneumonia after operations have been attributed to the filthy state of the patient's mouth.

If the teeth are decayed and there is time, a dentist should be consulted.

Urine.—It may be highly dangerous to operate on patients suffering from such diseases as diabetes or nephritis. It is very necessary that the urine should be tested before an operation, since these conditions may not be suspected until an examination of the urine discloses the fact that it contains albumin, pus, sugar, or blood.

If such an examination has not been made and cystitis, though present, is not discovered till after the operation, it may be attributed to the carelessness of the nurse if she has had to pass a catheter.

The following tables will serve as a guide for the examination of urine :—

1.—Ascertain the Quantity from which the Specimen is taken.

The quantity of urine passed for each 24 hours should be measured; the normal amount is from 40 to 60 ounces in 24 hours.

The quantity of urine is decreased with—
Fever.
Cardiac disease.
Acute nephritis.
Some cases of chronic nephritis.
Peritonitis.
Severe hæmorrhage, vomiting or diarrhœa.
By certain drugs such as opium or ergot.
Some surgical diseases of the kidneys.

After an abdominal operation the quantity of urine passed for the first day or two will generally be less than normal, due to the fact that the patient will not be taking much liquid.

In certain cases of shock after operation the quantity of urine passed is markedly reduced. This is especially noticeable after the radical operation for carcinoma of the cervix uteri.

The quantity passed in the natural way may also be reduced if there is a vesico-vaginal fistula or a uretero-vaginal fistula, complications due to sloughing after a difficult operation involving the ureters or bladder, such as in some operations for cancer of the cervix.

If one ureter is accidentally tied in the course of an operation, the amount of urine will be decreased, and urine will not enter the bladder if both ureters have been tied.

The quantity of urine is increased with—

Diabetes.

Hysteria.

Most cases of chronic nephritis.

When a large amount of fluid is taken, and by the action of certain drugs such as acetate of ammonia, potassium citrate, and digitalis.

2.—Notice the Colour, the Clearness, and the Presence or Absence of Deposit.

The specimen of urine should be kept in a clean specimen glass, on which should be fastened a label stating the name of the patient and the date and time the specimen was taken. The best sample of urine to keep for testing purposes is that passed first thing in the morning. If possible the specimen of urine should be obtained before the bowels act.

Urine should not be stirred before testing, since if there is a deposit this should be tested separately.

If there is a slight cloud due to mucus the specimen should be passed through a filter paper.

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(a) *The specimen is clear*.

Normal urine is a clear straw-colour.

It is darkened if the quantity of urine is diminished, and pale when the quantity is increased.

Blood from the kidney colours the urine black, or gives it a smoky appearance, according to the quantity of the blood.

Blood from the bladder colours the urine red.

Bile colours urine dark olive-green.

Absorption from carbolic acid solutions turns the urine a light olive-green.

Uric acid forms a deposit having the appearance of fine red sand.

Phenolphthalein, by mouth, colours an alkaline urine red.

(b) *The specimen is not clear*.

The cloudiness or deposit may be due to—

Mucus.

Phosphates (soluble in dilute acetic acid and do not disappear on boiling).

Urates (when the cloud will disappear on boiling).

Pus.

Blood in quantity.

Urates are usually yellow or brick-red in colour. Their presence is of little importance. They occur in febrile states, and in health in concentrated urines, as for instance after vigorous exercise.

3.—Test the Reaction.

Normal urine is acid.

Acid urine turns blue litmus paper red and has no effect on red litmus paper.

Alkaline urine turns red litmus paper blue and has no effect on blue litmus paper.

It may be alkaline after a meal, especially of vegetable food ; in some cases of cystitis ; while the patient is taking certain drugs such as citrates, and also from decomposition on exposure to air. If the urine is alkaline it must be made acid by a few drops of dilute acetic acid before applying further tests.

4.—Take the Specific Gravity.

The temperature of the urine should be, approximately, that of the room temperature.

See that the urinometer floats and stands clear of the sides of the vessel : read the number with the eye on a level with the surface of the urine.

The normal specific gravity is between 1015 and 1025.

A low specific gravity may be only temporary ; if permanent it suggests kidney disease.

A high specific gravity with pale urine suggests diabetes.

5.—Examine for Substances in Solution.

When examining urine for the quantity of albumin or sugar present it should be taken from a 24 hours' specimen.

These may be—
Phosphates.
Albumin.
Blood.
Bile.
Glucose (also called grape sugar and dextrose).

The presence of one substance does not preclude that of another.

A. *Test for Albumin (Protein).*

Boiling Test.

Fill a *clean* test-tube for about 3 inches with the specimen of urine which has been filtered : hold the tube over the naked flame of a spirit lamp so that the upper half of the urine is boiled, leaving the lower half cool to compare it with. If the boiled portion be *clear* the urine does *not* contain phosphates, albumin, blood, or pus. If the boiled portion be *cloudy* it probably contains phosphates or albumin. Add a few drops of dilute acetic, or one drop of nitric acid, when if the cloud is due to phosphates it will disappear, as the acid dissolves phosphates and not albumin.

Nitric Acid Test.

Pour a small quantity of nitric acid into a clean test-tube ; allow a similar quantity of urine to trickle steadily down the side of the test-tube. Where the two fluids meet a ring of coagulated albumin is seen.

This test is useful if a small quantity of urine only is available.

Nitric acid is not, nowadays, used by midwives in their practice, since there have been occasions on which a midwife has mistaken her bottle of nitric acid for silver nitrate, and instilling a drop of the former into the eyes of the child after its birth, the eyesight has been destroyed.

Salicyl-Sulphonic Acid Test.

Pour a few drops of salicyl-sulphonic acid, 40 per cent., into the urine. If albumin is present small " cloudy streams " will be seen sinking to the bottom.

The quantity of albumin may be ascertained by Esbach's albuminometer. This is a graduated corked test-tube. If the urine is alkaline, render it slightly acid with dilute nitric acid. If the specific gravity is over 1010, dilute the urine sufficiently to reduce the specific gravity below that level. Fill the tube with urine up to the mark (U). Add the reagent (Esbach's solution of picric acid and citric acid) up to the mark (R). The tube is then gently inverted a few times to allow the fluids to mix, after which it is corked and kept standing upright for 24 hours. The albumin which is deposited is read off on the graduated marks, which represent grams of dried albumin per litre of urine. The percentage of albumin is obtained by dividing by 10. Allowance must be made if the urine has been diluted before the estimation was undertaken.

B. *Test for Blood.*

1. Boil and cool. Add ½ inch of glacial acetic and mix. Add 1 inch of ether and invert the tube several times. Into another test-tube add ½ c.c. of alcoholic guaiac

solution and 2-3 c.c. of ozonic ether. Pipette the ethereal extract from the first tube into the tube containing the guaiac and ozonic ether. If blood is present a blue colour will develop.

2. Pour about an inch of urine into a test-tube and add one drop of tincture of guaiacum, then add an excess of ozonic ether letting it run down the side of the test-tube : if blood is present *a blue ring* will form where the fluids meet.

C. *Test for Bile*.

i. *Bile Pigments*.

1. *Bile in the urine* in any quantity always colours it. Fill a test-tube ¾ full of urine. Shake vigorously. If the urine contains bile the froth will be coloured yellow.

2. Run a few drops of urine from a pipette onto a white tile and beside them a few drops of strong nitric acid ; allow the urine and acid to run together ; where the two fluids mix a passing play of colours, of which one *must* be green, will appear if bile be present.

3. Add 0·5 per cent. tincture of iodine drop by drop to the urine. A dark green colour develops.

ii. *Bile Salts*.

Hay's Test.

Place the urine in a glass beaker. Sprinkle some sublimed flowers of sulphur on the surface of the urine. If bile acids are present the sulphur sinks, sooner or later, in accordance with the percentage of salts.

D. *Test for Sugar*.

If the urine is pale, increased in quantity, and of high specific gravity, sugar should be suspected.

1. A small quantity of freshly made Fehling's solution is poured into a test-tube and boiled, an equal quantity of urine is then added and heated—an orange-red deposit proves the presence of sugar. Instead of

Fehling's solution, its component parts may be used separately—the liquor potasse and the urine being boiled together first and a few drops of sulphate of copper solution then added ; if sugar is present the result will be the same.

2. *Benedict's Test.*

Place 5 c.c. of Benedict's reagent into a test-tube and add 8 drops of urine. Boil over a flame for 5 minutes. Some idea of the amount of sugar present may be obtained by allowing the tube to stand for a few minutes.
Greenish liquid without deposit, 0·1 per cent.
Yellowish deposit with greenish liquid above, 0·2 per cent.
Orange deposit with colourless liquid above, more than 2 per cent.

The quantity of sugar may be estimated by the *fermentation test*. Take the specific gravity and place the urine in a corked bottle with a small quantity of German yeast, leaving a hole in the cork. Leave the bottle in a warm place for 24 hours, then use the sugar test to be sure that the sugar has all disappeared, and if such be the case subtract the present specific gravity from that 24 hours ago, and the difference is a rough estimate of the number of grains of sugar in each ounce.
The specimen for this estimation must be taken from the collected quantity passed in 24 hours.

The nurse must remember that a vaginal discharge of blood or leucorrhœa may easily contaminate the urine as it is being passed, in which case the test for blood or albumin would be positive. There is no chance of the nurse failing to remember this in the case of a vaginal discharge of blood (menstruation, etc.), as she will see the blood when attending to the patient. A leucorrhœal discharge, however, may easily escape notice, and if, therefore, only a faint cloud of albumin is found on testing the urine the doctor will require a catheter specimen. A large quantity of albumin will not be due to leucorrhœa.

E. *Tests for Acetone Bodies. Never omit if Sugar is present.*

These will be found present in acidosis, delayed chloro-form poisoning, and markedly so in diabetes. Acetone is the forerunner of diacetic acid into which it is decomposed.

i. *Aceto-acetic Acid or Diacetic Acid.*

Ferric Chloride Test.

Add a few drops of 10 per cent. ferric chloride to 1 inch of freshly passed urine in a test-tube. At first a precipitate of ferric phosphate appears. Continue to add ferric chloride, the phosphate will dissolve and a port-wine colour appears if diacetic acid is present.

Rothera's Test.

Into a test-tube pour 1 inch of urine. Add to it 1 inch of ammonium sulphate crystals and shake. Add 2 drops of a freshly prepared weak sodium nitro prusside and 1 inch of concentrated ammonia. A permanganate colour develops in the presence of diacetic acid.

6.—Examine the Deposit.

The deposit may consist of—

Urates—disappear on boiling.

Phosphates—disappear on adding dilute acetic acid.

Uric acid—resembles cayenne pepper grains, lying at the bottom of the specimen glass.

Mucus—no importance. Filter urine.

Red blood cells can best be detected by a microscopical examination. If present in large numbers a red deposit colouring the supernatent urine reddish-brown or yellow.

Pus cells.

To test for pus, to the deposit add an equal quantity of liquor potasse and shake. If pus is present the mixture will become thick and ropy.

Another test is to add ozonic ether to the deposit, and if pus is present bubbling will take place.

Douching.—The method of giving a douche is described on page 213.

Vaginal operations.—Douching is not desirable unless there is a foul discharge, in which case the patient should be douched for several days before the operation.

Bath—Shaving—Preparation of the Skin.—See pages 258 to 259.

Bowels.—*Minor and Major Operations.*—Two nights before the operation an efficient aperient should be given to the patient, so that her bowels may act thoroughly. Some surgeons prefer castor oil, others some such mixture as the following :—

Sulphate of magnesia	4 drachms
Sulphate of soda	1 drachm
Extract of liquorice	20 grains
Essence of peppermint	10 minims
Infusion of senna to	2 ounces

If the operation is of an urgent nature and there has not been time to give an aperient, an enema should be given, if possible, 4 hours before the operation.

If the bowels are not efficiently attended to before an abdominal operation a loaded colon may interfere somewhat with the operator, and flatulent distension of the bowels following the operation is likely to be increased.

Bladder.—*Operations on the Vulva, Vagina, Cervix.—Abdominal Operations.*—It is most important that the catheter should be passed *just before the operation*, since if the bladder is not empty there is danger of the operator cutting into it owing to its distended condition ; moreover, the full bladder will obscure the field of operation. The best time to empty the bladder by catheter is when the patient is on the trolley in the anæsthetic room, before the anæsthetic is administered, otherwise it should be passed when the patient is in the correct position for the operation.

In some cases a fibroid or ovarian tumour will so press on the urethra that the nurse may have great difficulty in passing, or be unable to pass, the catheter, which should be of rubber and not of glass. If so, she should always inform the operator of the fact.

In the radical operation for carcinoma of the cervix, the surgeon will probably pack the vagina with gauze soaked in some antiseptic solution after the patient is anæsthetized and on the operating table. In this case the bladder should be catheterized just before the packing is inserted.

Dress.—The patient should be dressed in a clean night-gown and flannel dressing-jacket ; she should have long woollen stockings reaching well up the thighs, and in addition, if possible, a jacket of gamgee tissue well covering the chest and which can be made by the nurse beforehand. Her hair, if long, should be done up in two plaits, and if she has any dentures these should be removed before she leaves the ward or her bed.

Food.—Up to the day of the operation the patient may have her ordinary diet.

The condition of the patient will be the guide as to what food she should be given, prior to the operation, for instance, whether, on account of weakness, stimulants and extra feeding will be necessary. If the operation is to be at 9 a.m., at 5 a.m. the patient is given a cup of tea and a rusk and butter. If the operation is to be at 2 p.m., then the tea and food is given at 10 a.m.

Menstruation.—An abdominal operation need not be postponed because the patient is menstruating. It is otherwise the case if the operation is a vaginal one, unless absolutely necessary.

8*

CHAPTER XXV.

THE ASEPTIC TECHNIQUE
IN HOSPITAL.

The technique of aseptic surgery is based upon the principle of preventing the infection of wounds by bacteria. The word aseptic means freedom from septic bacteria and their spores.

Such a technique can be almost perfect but only if the case is a clean one, that is, if the operation area is not already infected and if everything that comes into contact with the wounded surfaces is sterile.

In a clean case, however, and with due care, the aseptic technique can be carried out with the exception of the sterilization of the skin. It is most difficult to sterilize the skin, and although, if the skin of the operation area is properly prepared, the danger of wound infection from this source will be very slight, nevertheless it must be admitted that it may be impossible to destroy all the bacteria which may have penetrated the sebaceous or fat glands of the skin without using chemical antiseptics of such a strength that the tissues would be injured.

Since every State Registered Nurse has, or should have, served a period of her training in the operating suite of her hospital, the directions and rules here given will probably differ somewhat in their respective hospitals.

The directions and rules given here are, in the main, those followed at the Middlesex Hospital.

The following subjects will be considered :—

The operating theatre and its furniture.

The preparation of instruments, ligatures, rubber gloves, sutures, saline solution, swabs, dabs, and dressings.

The preparation of the hands of the nurses.

The clothing of the theatre and ward sisters and of the theatre nurse.

The duties of the theatre sister.

The duties of the theatre nurse.

The duties of the ward sister.

Preparation of the operation area.

The Operating Theatre and its Furniture.

1. *Every day* the floor of the theatre is scrubbed and the walls are swept down. The sinks and wash basins are washed both inside and out, and the wall behind them washed, the waste pipes in connexion with the basins and sinks being cleaned by a brush.

2. The electric light fittings are dusted daily and the shades of the lights over the operating table washed.

3. *Every 6 weeks* the whole surface of the theatre walls is washed by the hospital porters.

4. The instrument and bowl sterilizers are scrubbed every day with soda and water.

5. The articles of furniture used for an operation are—

> An operating table.
> An instrument table.
> A swab or dab table.
> One or two dressing tables.
> Two bowls or tripods for hand lotions.
> A stand for bowls if wet swabs are used.
> A surgeon's stool in case he requires one.
> An anæsthetist's table.
> An anæsthetist's stool.

Furniture, of which the metal part is chromium-plated, is swabbed over with methylated spirit. Other furniture is carbolized with a solution of 1 in 20.

The position in which such furniture is placed varies with the choice of the individual surgeon.

A reference to Figs. 62 and 63 shows the positions used by the author for major and minor operations respectively.

6. The theatre floor in the neighbourhood of the operating table, and also any tables or tripods, if they have been soiled, are swabbed down between each operation.

7. The doors of the anæsthetizing room are kept closed during the administration, otherwise the patient may be alarmed at the appearance of the theatre and the people therein, including the surgical and nursing staff, and students. This door as well as other doors leading into the theatre, and its windows, are kept closed during the operation.

FIG. 39.—A SURGEON'S OPERATING ROOM, 1690.
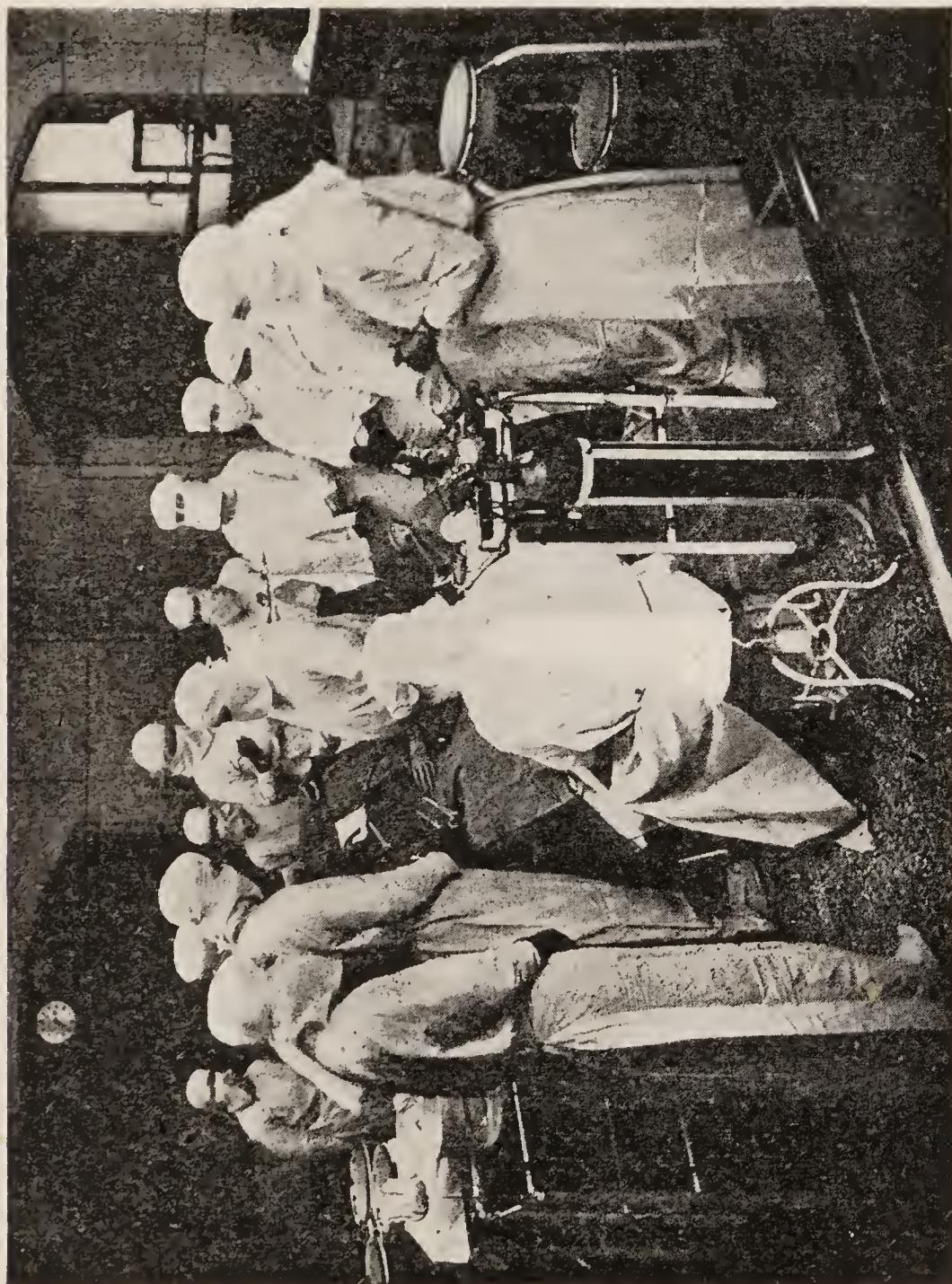
FIG. 40.—A MODERN OPERATING THEATRE (AUTHOR'S THEATRE, MIDDLESEX HOSPITAL).
Surgeon, house surgeon, anæsthetist, dressers, theatre sister, ward sister, theatre nurse.

Preparation of the Instruments, Ligatures, Sutures, Rubber Gloves, Saline Solution, Swabs, Dabs, and Dressings.

Instruments.—

1. The nail-brushes used by the surgeons, students, and nurses are boiled daily, and placed before use in a bowl of weak lysol solution, or mercurial solution.

2. All instruments to be used, except the needles, knives, and scissors, are boiled 20 minutes before each operation, a pinch of bicarbonate of soda being added to the water. The lid of the sterilizer is kept closed while the instruments are being boiled, to prevent the steam escaping into the theatre. In addition, there is a canopy over the sterilizers with an electric fan to extract any steam escaping from the sterilizer.

3. The needles, knives, and scissors are placed in pure lysol and rinsed in methylated spirit before being used.

4. The same knife is never used for more than one case, after which it is boiled for 3 minutes and sent away to be resharpened. In more recent times detachable blades have been used. The scissors and needles are replaced in pure lysol and rinsed in methylated spirit after use.

5. All porringers, dishes, and receivers are sterilized by boiling, after which they are placed on a table and covered with sterilized towels the edges of which overlap the sides of the table.

6. The best way to clean instruments is to put them into a basin and cover them with cold water until there is time to clean them. Later they should be well washed with cold water, soap, and soda to remove the blood-stains, after which, if necessary, they should be polished with some plate powder, and then again washed with hot water and scrubbed. All the joints, serrations and locks should be carefully examined to see that no *débris* is adhering to them, and if the blades of the forceps or scissors are fixed by locks, they should be separated before being cleaned. The instruments should then be boiled for 15 minutes before being returned to the instrument cupboard. Lysol forms a very good medium in which to wash the instruments. If a flushing curette has been used a stream of cold water and a fine wire should be passed through its canal to remove any

blood, and the instrument should then be boiled, after which a little methylated spirit, or better still, ether or Rangoon oil, run through it to prevent any rust forming.

7. Rubber tubing is boiled for 20 minutes and afterwards kept in a solution of 1 in 60 carbolic acid. When required, the tubing is removed direct from the glass-stoppered jar with a pair of sterilized forceps. Any portion which is not used is boiled for 10 minutes before it is returned to the jar.

Ligatures and Sutures.—

1. The silk or thread is boiled for 45 minutes and is used fresh for each case.

2. Silkworm gut is boiled for 30 minutes and then kept in a solution of 1 in 60 carbolic acid.

3. Catgut already prepared and put up in sealed glass tubes is used. The tubes are covered with wool to lessen the risk of breakage, and then completely immersed in a bowl of 1 in 1000 perchloride of mercury for 30 minutes before use.

Rubber Gloves.—

1. The gloves are either sterilized by the high-pressure sterilizer or boiled for 20 minutes and, if the latter, are then placed in whatever lotion the surgeon directs.

2. Prior to their removal from the hands the gloves are well·washed in soap and cold water, this being the best way to remove any blood or pus sticking to them.

As the gloves are removed they are inverted, well soaked in cold water, and their original inner surface then washed, after which they are examined for punctures.

3. The gloves are boiled for 7 minutes, then well dried and powdered with talcum powder.

CAUTION.

Rubber gloves are worn to protect the patient and not the nurse.

All punctures should, therefore, be mended, or failing this, the gloves must be discarded.

Normal Saline.—

1. Concentrated saline solution is kept in a stoppered Winchester quart bottle, and is of such a strength that 1 ounce of the solution to 19 ounces of water makes a normal saline solution.

2. Each day a certain amount of this normal saline solution is prepared and boiled for 20 minutes and then stored in sterilized bottles.

FIG. 41.—MINOR OPERATING TIN OF STERILIZED DABS, DRESSINGS, AND CLOTHING AS PUT UP FOR THE AUTHOR BY MESSRS. BELL & CROYDEN.

Showing leggings, perineal cover, overalls, masks, towels, dabs, tampons, T bandage, dressings.

3. When required a sufficient quantity is poured into a sterilized porringer or jug. At the end of the day if any of the solution is left in the bottle it is added to the next day's supply and boiled with it.

Dabs.—

These are made of absorbent cotton-wool wrung out of a solution of perchloride of mercury 1 in 2000. Dabs will be needed for minor operations upon the vulva, vagina, and

cervix. The number required will depend rather on the nature of the operation. Three dozen will probably be sufficient for any case, and if any are left over they can be used later when dressing the patient. Some surgeons prefer pieces of gauze about 6 inches square folded in four. In some cases such dabs are more convenient to use but their cost is much greater.

Swabs.—

For abdominal and vaginal sections the swabs are made as follows :—

Some gamgee tissue is cut into square pieces, after which their edges are tucked in and sewn. Two sizes should be made, 12 × 12 inches and 6 × 6 inches. As a rule 12 swabs will be quite sufficient for most operations, two 12 × 12 inches and ten 6 × 6 inches. In many cases not half this number will be used. The squares are sewn together like a mattress. They are sterilized in the high-pressure sterilizer. Some surgeons use squares of muslin only, in which case there must be 8 layers sewn together in a similar way to those made of gamgee.

As gamgee is expensive, swabs serving the same purpose can be made by enclosing a layer of absorbent wool between muslin.

When used for an abdominal operation some surgeons have tape 8 inches long sewn to the edge of the swabs, as as additional precaution against the danger of their being left in the abdomen at the conclusion of the operation.

Dressings.—

Perineorrhaphy and Colporrhaphy.—Some surgeons insert a piece of sterilized gauze into the vagina to act as a drain ; this is removed the morning following the operation ; another piece is placed over the stitches, and this is kept in place by a pad of absorbent wool and T bandage.

Excision of Bartholin's Cyst, Cancer of Vulva.—A piece of cyanide or plain sterilized gauze is placed over the parts, and then a pad of absorbent wool, which is kept in place by a T bandage.

Curetting.—Whether gauze drain is inserted into the vagina depends on the practice of the surgeon. In some cases the operator may wish, if there is undue bleeding from the uterus, to pack it with gauze. In this case he will require the gauze, which should be ready and suitably protected, to be handed to him in a long continuous strip about 2 inches broad. The gauze in either case is removed within 24 hours.
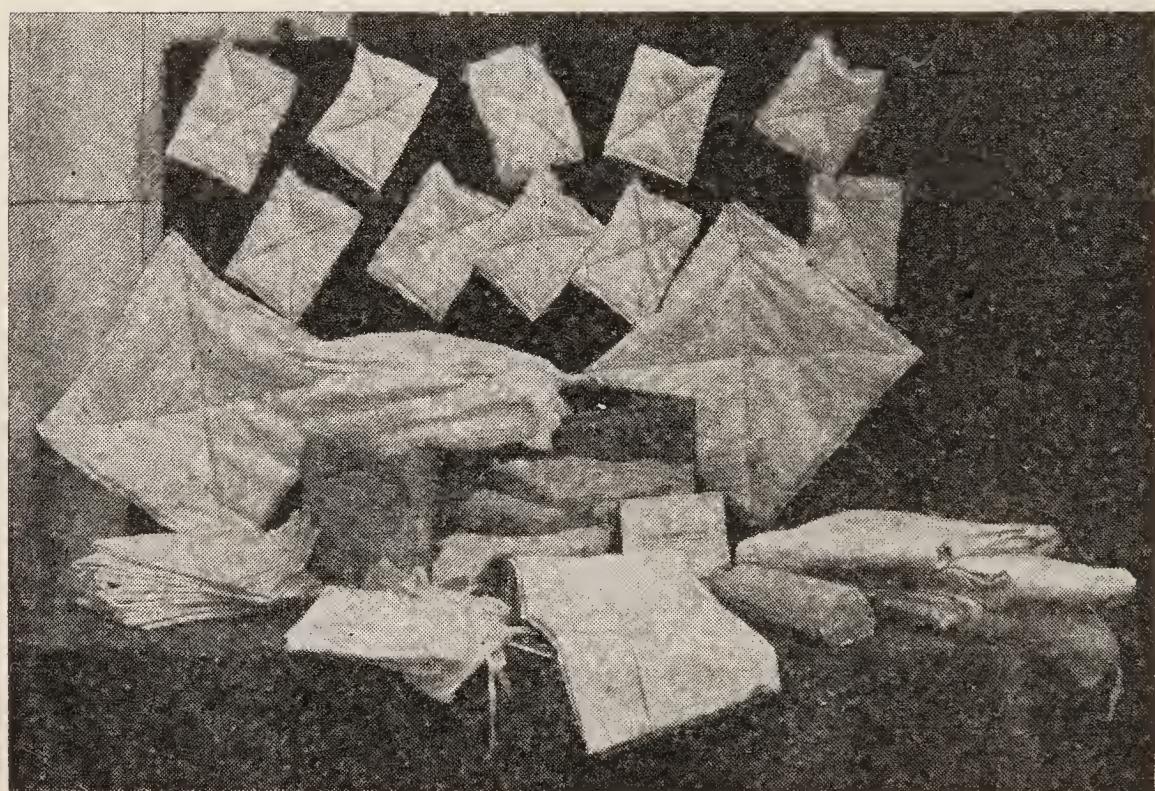
FIG. 42.—MAJOR OPERATING TIN OF STERILIZED SWABS, DRESSINGS, AND CLOTHING AS PUT UP FOR THE AUTHOR BY MESSRS. BELL & CROYDEN.

Showing 10 small swabs, 2 large swabs, overalls, masks, body-cover, towels, dressings, many-tailed bandage.

A pad of absorbent wool and a **T** bandage then completes the dressing.

Excision of Vaginal Cyst or Tumours.—Unless there is any troublesome oozing (when the vagina is packed for a few hours with gauze or tampons), a pad of absorbent cotton-wool and **T** bandage is all that is used.

Operations on the Cervix.—As for operations on the vagina.

Vaginal Hysterectomy.—As a rule, most surgeons insert a small quantity of sterilized gauze, which acts as a drain through an opening at the top of the vagina into the pouch of Douglas.

Abdominal Section.—The wound is dressed with dry dressing, consisting of gauze, absorbent wool, and a many-tailed binder. Rarely, consequent on some oozing of blood or escape of pus, the operator may wish to drain the pelvis, in which case he will require a drainage tube. A safety-pin which has been boiled will be required to prevent the drainage tube slipping into the abdominal cavity. The patient should be measured for the binder prior to the day of the operation, in order that it may fit comfortably.

Preparation of the Hands of the Nurse.

Before helping in any way with the operation, or when preparing the instruments, the hands should be thoroughly washed for a period of 3 minutes in running water.

The hands and forearms are scrubbed with a sterilized nail-brush and soap and water until a good lather is obtained, particular care being given to the nails and clefts between the fingers. When a good lather is obtained, the washing is continued with plenty of soap and hot running water.

If gloves are going to be worn the soap is removed with the running water and the gloves are then applied as directed. If, as in the case of the nurse appointed to be the theatre nurse, gloves are not being worn, her hands are dried on a sterilized towel, which should not be used again for a similar purpose.

CAUTION.

1. All nurses working in the theatre should be quite healthy. Such conditions as carious teeth, sore throats, or septic wounds of the fingers are especially dangerous.

2. Rough skin harbours microbes to a much greater extent than smooth skin. It is possible to keep the hands smooth by not dipping them into too strong an antiseptic solution and by avoiding those antiseptics which experience proves do not agree with the skin of the particular person concerned. In addition, after the nurse has finished her work and her hands

have been well dried, a little diluted glycerine should be rubbed into them.

3. The nails should never be cleaned by scraping them with a knife, nail-cleaner, or pair of scissors. They should be kept short enough to allow of their being effectively cleaned with the nail-brush.

4. Pus should not be touched with the bare fingers, and dirty dressings should be removed with dressing forceps.

5. All rings should be removed, even if one happens to be a wedding ring. Nurses when on duty in a hospital are not allowed to wear rings, but nurses practising in private have been known to do so, as well as, in some queer cases, even an arm bracelet.

Clothing of the Theatre Sister, Theatre Nurse, and Ward Sister.

Overalls, Veils, and Footwear.—

1. The theatre and ward sisters and theatre nurse wear clean linen dresses, the sleeves of which can be rolled up above the elbows.

2. All nurses in the theatre wear sterilized overalls and masks.

3. The overalls are, before being sterilized, so folded that the surface which will be in contact with the body is outermost.

4. After the overall has been taken from the tin by the person who is going to wear it, it is held so that it becomes unfolded and the arms are then slipped into the sleeves and held out straight in front.

5. The theatre nurse adjusts the overall of the theatre and ward sisters by pulling it into place by means of its tapes which are then tied. The clothes at the back should be completely covered. She also adjusts the veil, *which should cover the nose*, as well as the mouth and chin.

6. Some surgeons require nurses on duty in the theatre to wear overalls, made of calico or some other material, over their shoes, legs, and up to their knees, where they are tied with a tape.

In some hospitals the surgeons and theatre nursing staff wear india-rubber boots.
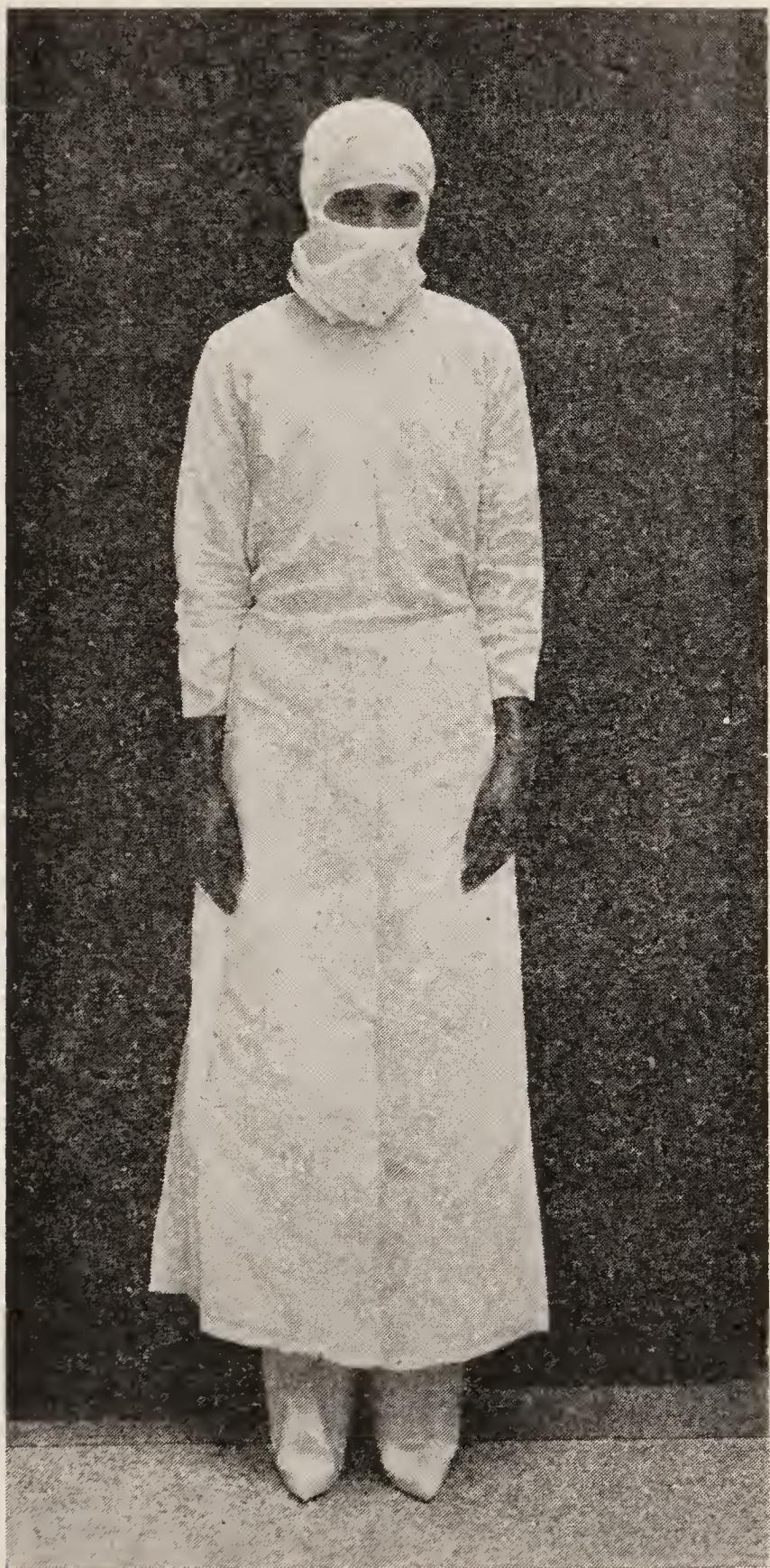
FIG. 43.—NURSE PROPERLY CLOTHED FOR ASSISTING AT AN
OPERATION.

See that the veil covers the nose, and that the ends of the sleeves of
the overall are covered by the cuffs of the rubber gloves.

Rubber Gloves.—

Rubber gloves, after sterilization, should be assembled in pairs and covered with a sterilized towel.

1. To put on a rubber glove which has been boiled it should first be emptied of the boiling water that remains in it after removal from the sterilizer, otherwise the hands may be badly scalded. It should then be filled with whatever antiseptic lotion is being used, and held with the fingers pointing downward and away from the bowl of lotion, over a dish, another bowl, or sink to allow the lotion to escape.

2. The hand corresponding to the glove should now be passed into the glove and, as it displaces the lotion, the hand should be raised and the lotion allowed to escape into the sink but not over the glove.

3. The cuff of the glove should then be pulled over the cuff of the overall so that the hand and wrist are covered entirely with sterilized articles (Fig. 43).

4. A rubber glove is best removed by raising the cuff of the glove, allowing a little water to enter, and then pulling on the cuff so that the glove is turned inside out. There is much less risk of tearing the glove by this method, than that so often employed by nurses of pulling off the glove right away in its soiled state.

Many surgeons require methylated spirit, or a solution of biniodide of mercury and spirit, to dehydrate their hands before putting on the gloves.

If rubber gloves sterilized by the dry method are being used, the hands should be dried with a sterilized towel first, after which they should be powdered with sterilized talcum powder applied with a piece of sterilized gauze.

Dry sterilization destroys india-rubber gloves much more quickly than boiling them.

CAUTION.

Do not try to eradicate any creases in the fingers of the glove which has been drawn on, by smoothing them out with the bare fingers of the other hand, as by doing so the glove may be infected.

With a little practice the gloves can be drawn on quite

easily without causing any creases. If the latter are present, they must be smoothed out by the gloved fingers of the other hand, or if the tips of the glove fingers are projecting in a collapsed condition beyond the fingers of the hand, the glove should be removed and reapplied. Some nurses, and also some doctors, appear to have an insuperable difficulty in putting on the rubber gloves by the method described. If such is the case an alternative method is to smear a little ether soap over the hands first.

The Duties of the Theatre Sister.

1. To make a list of the instruments used and their number. At the end of the operation the surgeon will ask whether the number of instruments is correct.

To ascertain, before the operation, from the surgeon or house surgeon what instruments will be required, unless she already knows.

2. Having prepared her hands, and put on her overall, veil, and gloves, she should, during the operation, touch only those articles which have been sterilized.

3. To cover the instrument table with a sterilized towel.

4. The instruments, sutures, and ligatures having been transferred from the sterilizer by the theatre nurse, the theatre sister should arrange them in the operating tray, or on the instrument table, according to the wishes of the surgeon, and should then cover them with a sterile towel.

5. All sutures and ligatures should, while being cut, be touched, so far as possible, with sterilized forceps only, and should be covered with a sterilized towel during the operation. When the catgut is required, she should remove the tube from the antiseptic with a sterilized towel and break the tube in this.

Unless otherwise directed the average length for a ligature is 18 inches, for a mattress suture 12 inches, and for a continuous suture 24 inches.

6. If there is more than one operation she should assemble the instruments for the next operation before the previous one is commenced or, if it is the duty of the theatre nurse to do this, the theatre sister should check the instruments

and their number in the second tray. By doing so, the instruments for the next operation can be sterilized during the progress of the one being performed.

7. At the termination of one operation she should remove her gloves, wash her hands, and assemble the instruments for another operation if necessary, as noted in paragraph 6. She should then wash her hands again, and put on a fresh sterilized overall and a pair of sterilized gloves, preparatory to arranging the sterilized instruments for the next operation.

8. She must sign her name in the anæsthetic book against the entry of every abdominal operation performed.

CAUTION.

The theatre sister should never fetch any instrument which, though not assembled for the operation, is later required, but should direct the theatre nurse to do so.

If a tray is used for the ligatures and sutures, care should be taken when cutting them off not to let them touch the edge of the tray. If a tray is not used, they must not be allowed to touch the edge of the table even when this is covered by a sterilized towel. Ligatures and sutures should be handed straight to the operator without allowing them to touch anything but sterilized instruments or gloves.

Sutures or ligatures must never be drawn through the fingers to straighten them or to estimate their length, as this increases their chance of being infected. If they happen to be curled, they should be straightened by pulling on each end.

A mattress suture should not be tied in the needle, and one end should be left longer than the other when the needle is threaded. Fig. 44 (1 and 2).

A continuous suture should always be tied in the needle with one knot, leaving one end short, about 2 inches. Fig. 44 (3 and 4).

There is a right way and a wrong way of fixing a threaded needle in a needle-holder or pressure forceps (Fig. 45), and of handing it to the operator (Fig. 45). The surgeon prefers the right way, and yet in spite of their training a large number of nurses, especially when acting as instrument nurse at

operations outside the precincts of a hospital, will insist on threading the sutures and handing the needles to the surgeon incorrectly. This shows great lack of observation even if not carelessness.
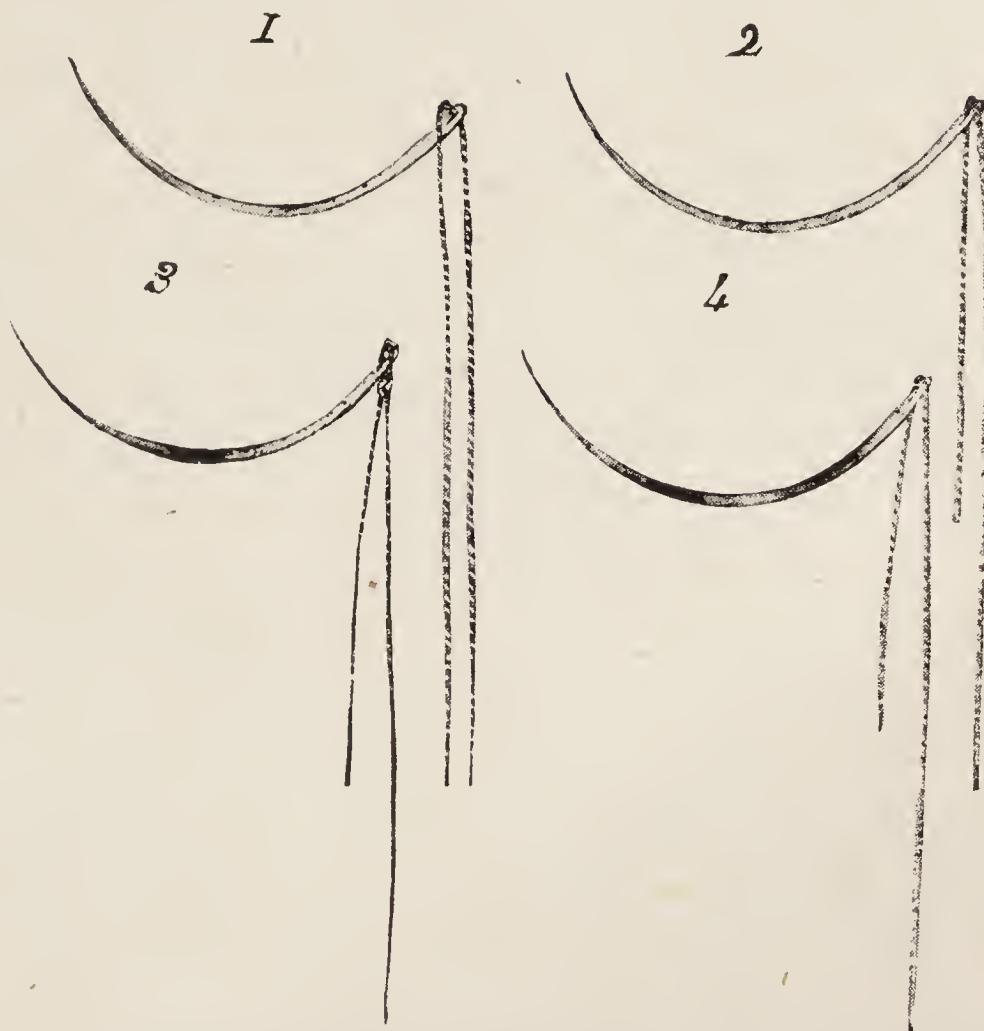
FIG. 44.—CORRECT AND INCORRECT METHODS OF THREADING THE NEEDLE WITH MATTRESS AND CONTINUOUS SUTURES.

Mattress Suture :—
1. Incorrect, both ends the same length.
2. Correct, one end longer than the other.

Continuous Suture :—
3. Correct, tied in with one knot.
4. Incorrect, not tied in.

If the number of instruments used has not been carefully noted a wrong answer may be given to the surgeon when he inquires if the number is correct before closing the abdomen, with the result that an instrument may be left in the abdominal cavity.

If a surgeon uses Reverdin's needle (or some modification thereof) his assistant threads the needle. In this case all the theatre sister has to do is to hand the correct length of suture to the assistant. The correct position for the theatre sister is then at the bottom of the operating table, opposite the knees of the patient, when she will be able easily to pass over the suture. In this case she will find it more convenient to stand
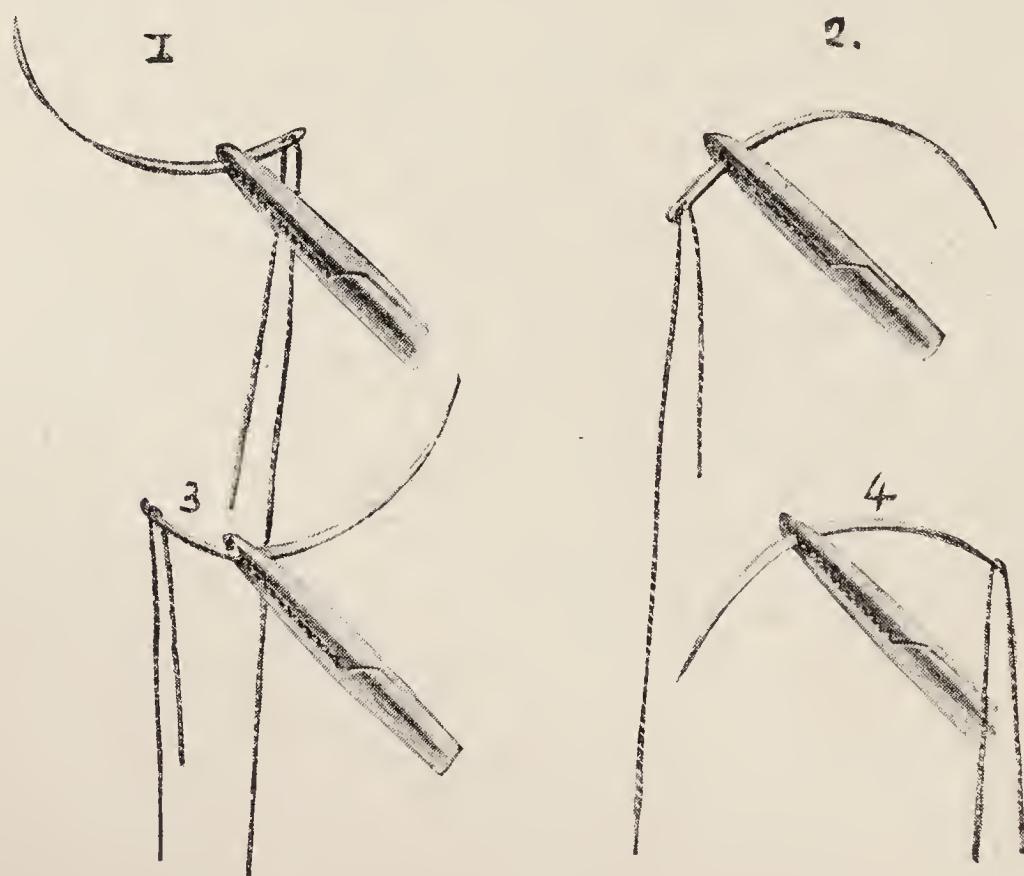
Fig. 45.—Correct and Incorrect Methods of Fixing a Threaded Needle in a Needle-Holder or Pressure Forceps.

1. Correct—the sharp point of the needle pointing upwards and towards the surgeon.
2, 3, and 4. Incorrect.

on a platform and have an instrument table that can be raised to a comfortable height. In the absence of such a platform and table she must place her instrument table on the right-hand side of the surgeon so as to be able to hand him easily and quickly, sutures, ligatures, and instruments. In addition she will find it convenient, and add to the perfection of the team work, if she cuts the sutures and ligatures the desired length before sterilizing them, keeping them thereafter in a

sterilized towel, or better still, threading them through a glass tube first and then sterilizing this.

Lastly, some surgeons use wristlets for their sutures and ligatures, in which case, having sterilized the wristlets and their contents, the theatre sister will not have to handle, or cut, the ligatures and sutures.

FIG. 46.—CORRECT METHOD OF HANDING THREADED NEEDLE TO THE SURGEON.

1. In pressure forceps, so that the surgeon can take hold of the end of the forceps.
2. With the fingers, so that the surgeon can grasp the needle with the pressure forceps.

The Duties of the Theatre Nurse.

In many large hospitals there are two theatre nurses.

1. To arrange the necessary furniture in its proper position.

2. To prepare the lotion for the hands, being careful that its strength and temperature are correct.

3. To wheel the instrument table, the top of which is covered with a sterilized towel, by its legs to the sterilizer. She should then with a pair of forceps, previously sterilized and kept in a sterilized or antiseptic solution, remove the instruments from the sterilizer, into the instrument tray or onto the instrument table as the case may be.

Alternatively the theatre sister can thus transfer the instruments, or the instrument table being placed in the position it will occupy during the operation, the theatre nurse can lift

the wire tray from the sterilizer, carry it to the instrument table, and turn out the instruments onto it.

4. When the patient has been lifted onto the operating table, the theatre nurse should place her in position as follows: The night-gown is drawn up to the chest and the blanket well below the pubes. The arms of the patient are then securely fixed by her side by arranging them straight along her sides under the macintosh, the palms of her hands in apposition with the table and slightly beneath her buttocks.

Trendelenburg Position.—

If the surgeon wishes the patient to be placed in the Trendelenburg position, the legs or ankles must be securely fixed with straps or bandages to the end of the table, which must be fixed at right angles to the rest of the table (see Fig. 36), before the anæsthetist tilts the table.

After the patient is tilted to the correct angle the theatre nurse should adjust the knee-instrument table devised by Victor Bonney, should the surgeon elect to use it.

Lithotomy Position.—

The best way to place the patient in the lithotomy position is for the theatre nurse standing at the bottom of the table, and with one hand under each buttock of the patient, to lift her down so that the buttocks project well over the end of the table. The anæsthetist at the same time pushes the shoulders of the patient.

5. To paint the skin of the operation site with the solution chosen by the surgeon unless the house surgeon does so.

6. To open the tin containing the sterilized body-cover and towels, if the operation is an abdominal one ; or the sterilized leggings, the perineal-cover, and towels if the operation requires a lithotomy position, so that the ward sister can gain access to these articles without infecting her hands with the outside of the tin.

7. If during the operation another instrument is required, to take it from the instrument case, sterilize it, and then hand it with sterilized forceps, or in the wire tray of the sterilizer, to the theatre sister.

8. If during the operation the surgeon requires a porringer or normal saline solution, to take one of the porringers or jugs already sterilized and hand it in a sterilized towel. A
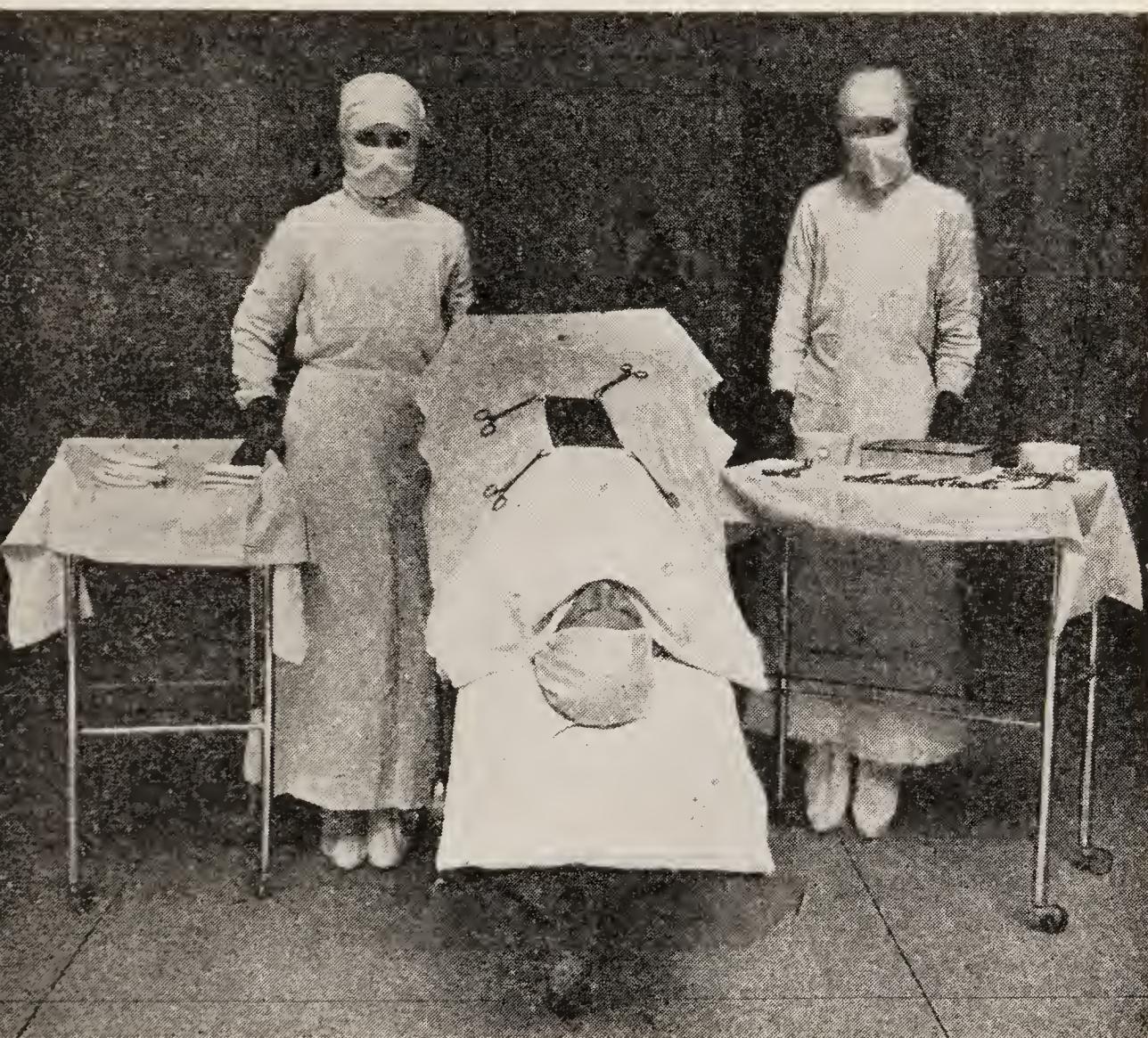
FIG. 47.—TRENDELENBURG POSITION.

Showing the theatre sister, ward sister, instrument table and swab table in their respective positions, and the sterilized body-cover in place.

small porringer or jug should always be carried by placing the hand outside and then separating the fingers and thumb, and not with the help of the thumb inside the article and the hand and fingers outside.

9. Not to touch anything which has been sterilized, unless so directed, without holding it in a pair of sterilized forceps or in a sterilized towel.
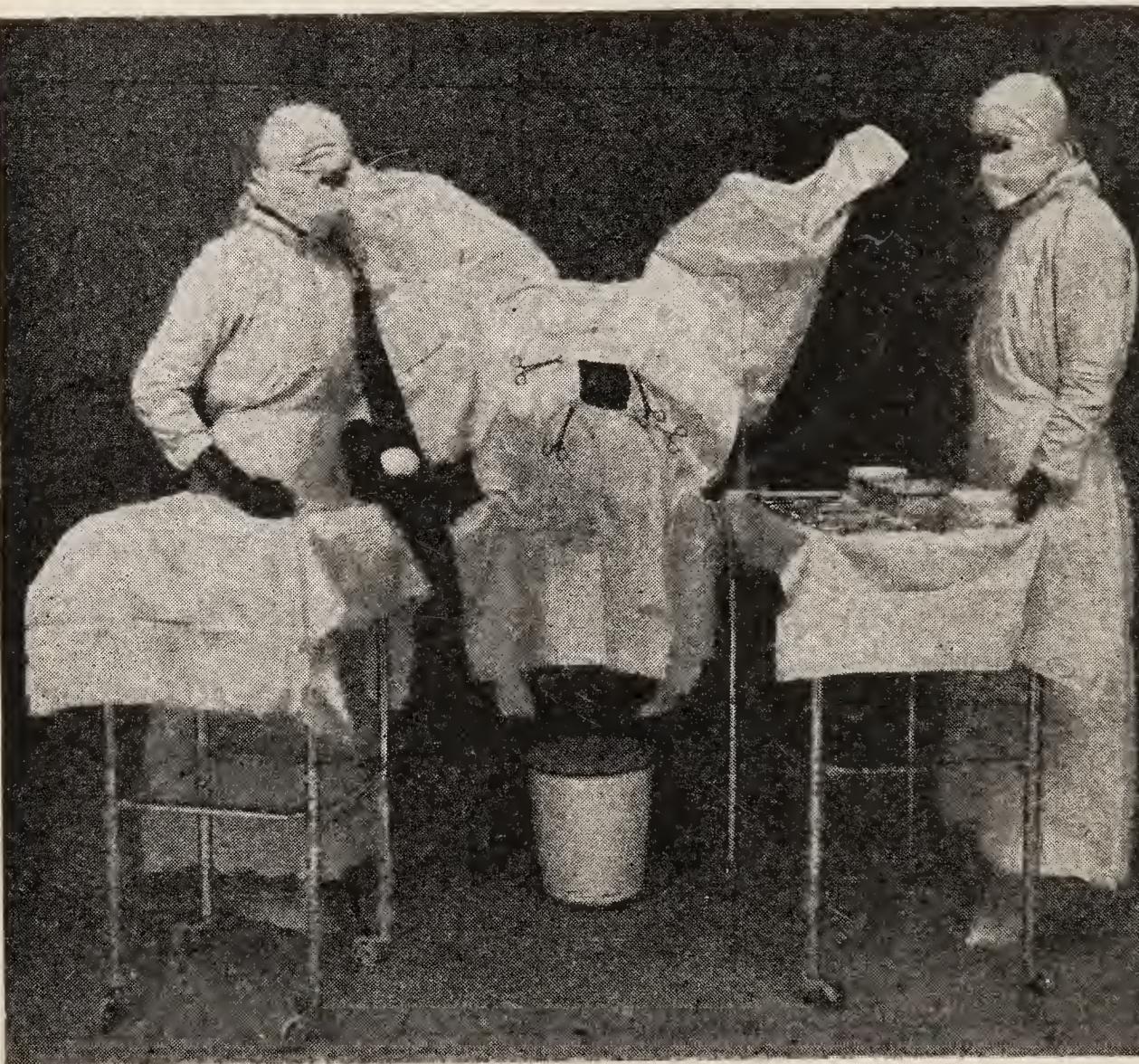
FIG. 48.—LITHOTOMY POSITION.

Showing the theatre sister, ward sister, instrument table and swab table in their respective positions. The buttocks are well over the end of the table and projecting over the tray. The sterilized leggings and perineal-cover, and towel over the tray are in place.

10. At the close of the operation to hand the tin of sterilized dressings to the surgeon, house surgeon, or ward sister as the case may be, having first opened the lid.

11. If the instruments which have already been used are required again during the afternoon for another operation, to clean and sterilize them.

12. To have the necessary articles assembled for catheterizing the patient during the operation. If the surgeon wishes a catheter to be passed, the theatre nurse should be prepared to do so if requested. Certainly one would not expect a nurse to undertake the duties of a theatre nurse without adequate training. Yet, nothing is so exasperating to a surgeon performing an abdominal operation as to be unduly delayed because a nurse is bungling about in her endeavour to pass the catheter.

13. At the close of the operation to arrange the clothes of the patient in a suitable manner, and cover the patient with a blanket prior to her removal from the theatre. Also to place a porringer and towel near the face of the patient in case she vomits.

CAUTION.

If the antiseptic in the lotion for the hands or gloves is too strong or is not mixed properly, the hands of anyone using it may suffer. This is particularly likely to happen if the surgeon uses a lotion containing carbolic acid, which may have been prepared of such a strength that it will anæsthetize his fingers. Also if, when the pure carbolic is added to the water, the solution is not thoroughly mixed, some of the chemical will accumulate at the bottom of the lotion bowl, and when the hands are placed in the lotion they may be badly burnt or blistered, an occurrence which the surgeon is never likely to forget and will certainly not excuse.

If the lotion is made too hot the hands of the surgeon may easily be scalded. The temperature of the lotion should be taken with a thermometer and should be about 100° F. It is notorious that nurses can place their hands, with impunity, in water at a temperature which would make the surgeon 'jump' if nothing more. In judging the proper temperature of the lotion for the hands, therefore, nurses must not be guided entirely by one which they themselves can tolerate.

The theatre nurse should be very careful not to drop any articles on to the floor. The noise occasioned by the dropping

of a bowl or porringer, for instance, is apt to annoy the surgeon considerably and the theatre sister especially.

Instruments or swabs dropped on the floor should not be removed until after the counting, unless the instrument happens to be one which cannot be dispensed with, when it should be cleaned and re-sterilized.

The Duties of the Ward Sister.

1. The theatre nurse having opened the tin containing the sterilized towels and body-cover, or the sterilized towels, leggings, and perineal-cover, the ward sister should, with the aid of the house surgeon or dresser, arrange these articles appropriately on the patient.

2. Having covered the swab table with a sterilized towel she should remove the sterilized swabs or dabs from the tin, which has been handed to her by the theatre nurse with the lid open, and place them on the swab table. Some surgeons prefer the swabs to be taken direct from the tin by the house surgeon or ward sister as required.

A different and newly opened tin containing sterilized swabs and dressings for each patient should be used.

3. Although the ward sister is not personally responsible for the number of swabs used in a major operation, nevertheless, when the operation is a major one, she must be careful to count the number of swabs she has taken from the tin.

The small swabs should have been tied up and sterilized in bundles of 5 and the number of swabs counted and entered on a piece of paper. At the termination of the operation the ward sister must satisfy herself that the number of swabs used added to the number left in the tin, if any, equals the original number sterilized in the tin, and if not, inform the surgeon. Alternatively the surgeon may ask the ward sister at the end of the operation if the number of swabs is correct, and if he is wise he will always ask this question after removing the large swab from the abdomen and before he inserts the peritoneal suture.

Although theoretically the surgeon should count the swabs,

it is customary to take the sister's word for the number being correct, and so a great responsibility in this respect rests on her.

4. Her further duties during the operation depend upon the wishes of the surgeon. Thus she may be directed to hand the swabs or dabs, to convey ligatures, sutures or instruments to the surgeon, or to help in the operation by holding an instrument or swabbing the wound.

5. At the close of the operation to assist in applying the dressing and in adjusting any bandages.

6. After the operation to stay by the patient until the ward nurse, who is waiting or has brought down the next case, is free to take the patient who has just been operated upon back to the ward.

7. To sign her name in the anæsthetic book against the entry of every abdominal operation performed.

CAUTION.

A swab should never be cut in half. The fact that this has been done may be forgotten and half a swab consequently left in the abdominal cavity.

Never allow any swabs to be removed from the theatre before the operation is completed and the patient has left the theatre.

Always be certain that the correct number of swabs, used and unused, is available for inspection by the surgeon if he wishes, just before the abdominal cavity is closed.

Swabs and instruments are most likely to get lost in an emergency operation. It is a moot point who is really responsible for the number of swabs which have been used at an operation. If the operation is in a nursing home, or private house, the surgeon is responsible in the author's opinion, and he should satisfy himself, by counting them, that the number of swabs and instruments is correct before he closes the abdominal wound. If the operation, however, is in a hospital in which there is a highly trained theatre sister and ward sister, the surgeon is entitled to assume that the sisters will keep a safe count of the swabs. He may have had a series of operations during the afternoon, some of them very

difficult and of an anxious nature, and may well be excused having to accept the additional responsibility of ensuring that the number of swabs and instruments is correct. In fact, the decision has been given more than once in a Court of Law that in such circumstances the responsibility is that of the sister in charge and not of the surgeon.

When assisting at an abdominal operation do not lean on the table, and during an operation with the patient in the lithotomy position do not lean against the patient, as by so doing the patient is tilted sideways.

Attend to your own duties and do not interfere or engage in conversation with other people unless absolutely necessary.

A chatty sister, nurse or anæsthetist is an abomination as is also a surgeon. So far as the surgeon is concerned his remarks should be directed to asking for any instrument he may require, and to informing the students (if any) of the steps of the operation. It is the mark of a good surgeon that with any increased difficulty in the operation, or in the presence of an emergency, the less talkative does he become.

Preparation of the Operation Area.

Before an operation the skin of the patient should be shaved over the operation area; she should also have a bath, and should have the skin in the neighbourhood of the operation site suitably prepared. Whether or not she should in addition be given a vaginal douche depends upon the directions of the surgeon. If there is hæmorrhage or a discharge, douches twice daily before and on the morning of the operation will probably be ordered, otherwise, if the operation is on the vulva or vagina, the parts will be swabbed with iodine, violet-green solution, or some other antiseptic the surgeon may order.

Shaving.—The vulva should be shaved before all operations on the genital organs. It is impossible to sterilize the pubic hair. The points to remember in shaving are, first of all, to have a sharp razor, a blunt razor is more liable to cut the patient; secondly, to cut the hairs short with scissors before using the razor; thirdly, to lather well the part for some time, and lastly, to dip the razor momentarily into boiling water before using it.

The best kind of razor to use is a safety razor, since with it a patient can be very closely shaved by the most inexperienced nurse, without the danger of her cutting the patient.

When the patient is fat, the nurse will experience difficulty in efficiently shaving the necessary area and, in such cases, this can be successfully accomplished either by placing a pillow in the hollow of the patient's back so that the pelvis is tilted or, better still, by making the patient kneel. When the shaving is finished any excess of soap and loose hairs are removed with swabs of absorbent wool, after which the patient has her bath.

Bath.—On the afternoon before the operation the patient, having been shaved, should have a hot bath, if this, because of her condition, is not contra-indicated, and she should well scrub and soap herself all over. The nurse should always ask the surgeon whether he wishes this bath to be given. Thus, in cases of extra-uterine gestation, when bleeding has taken place internally, or in acute inflammatory conditions of the pelvis, the nurse will be directed to wash the patient in bed.

Preparation of the Skin in Abdominal Operations.—

If the skin is properly cleansed, not only will stitch abscess, a troublesome condition which often causes more distress and trouble than the original operation, be less common, but there will be less risk of the operator conveying any septic matter from the skin into the peritoneal cavity, and so infecting the peritoneum.

The patient having returned from her bath, is put to bed. Her nightdress is rolled up all round to her chest, and the bed-clothes covering her are removed with the exception of a blanket which is turned down below the pubes.

As the cleansing of the abdomen will necessitate some exposure, the nurse must see that the temperature of the room is not below 65° F., that the doors are closed as well as any windows through which the wind can blow directly on the patient.

The nurse should then—

1. Turn up the sleeves of her dress above the elbows.

2. Collect all the materials she will require on a dressing trolley or table.

3. Wash her hands thoroughly with soap, hot water, and a nail-brush, and then put on sterilized india-rubber gloves.

4. Spread sterilized towels round the part to be washed.

5. Rub in ether soap until it is dry in order to obtain its penetrating action on the skin.

6. Scrub the skin gently but thoroughly with sterilized wool and hot sterilized water.

7. Remove the lather with a sterilized swab. Be careful to wipe the outer limits of the cleansed area last.

8. Thoroughly rub the cleansed skin with a sterile swab soaked in ether, or methylated spirit, removing any excess with another swab.

9. Paint the operation-area with the solution ordered by the surgeon.

10. Spread sterilized lint over the area, seeing that the covering is adequate, and bandage firmly in position.

The area to be painted for an abdominal operation of a gynæcological nature should be included between a line drawn across the body at the level of the epigastrium and one drawn across the thighs below the level of the vulva.

The following solutions, among others, are used by surgeons to paint the operation area :—

Violet-Green Method.—

For sterilizing the skin, this method has been proved, by bacteriological tests, to be the most efficacious of any, the skin being sterile after treatment, whereas it is not with the iodine method. This method owes its superiority to the fact that the dye penetrates the superficial layers of skin as also the fat and sebaceous glands and hair-follicles, situations in which organisms are so commonly found, much more readily than iodine used in such a strength, and for such a time, that the skin will not be injured.

The solution contains 1 per cent. of a mixture of equal parts of hexa- or penta-methyl violet and sulphate of zinc-free brilliant green, dissolved in equal parts of rectified spirit and water, the powder being dissolved in the spirit before the water is added. Six hours before the operation the solution is painted over the skin of the operation area four times, and

a compress of lint soaked in the same solution diluted with an equal quantity of sterile water and covered by a piece of water-proof batiste is then applied and kept in position by a binder. For operations on the vulva the solution is used half strength before applying the compress, since irritation of the skin is caused in some cases when the full strength is used.

If the vagina has to be packed the solution is used half strength, and the packing is inserted just before the operation when the patient is under the anæsthetic.

The disadvantage of the violet-green method is that the dye stains any linen brought into contact with it. The nurse should wear india-rubber gloves, the patient an old nightgown, and the painted area must be so protected that the bed linen is not stained. The dye can be removed from the skin by a solution of 1 per cent. hydrochloric acid in rectified spirit.

Iodine Method.—

This method depends upon the power which alcohol possesses of penetrating the deeper portions of the skin. If the skin is wet, or damp, iodine does not penetrate so well as when the skin has previously been kept dry for some hours. If possible 3 or 4 hours should elapse between the patient's bath and the application of the iodine solution. The solution commonly employed is one of 2 or 3 per cent. iodine in rectified spirit; it must not be mixed with methylated spirit, as it will then give off a vapour most irritating to the eyes. Two applications are required, one in the morning of the operation, and a second in the theatre; the solution should be fresh.

The nurse should—

Rub the part over three times with a clean swab soaked in ether. Apply the iodine with a sterile swab soaked in the iodine solution. Cover the part with dressing or a sterilized towel and keep this in position with a bandage.

In the theatre the dressing is removed and the theatre nurse should again apply the solution, unless the surgeon or house surgeon elects to do so.

Occasionally iodine causes great irritation of the skin and serious complaint by the patient. It is, therefore, advisable to

ask the patient, before applying the iodine, whether she has had iodine applied to her skin before, and if so, whether irritation of the skin followed.

Picric Acid Method.—

The strength of the solution is 3 per cent. picric acid in 50 per cent. alcohol, and it is applied in the same way as indicated under the iodine method.

CHAPTER XXVI.

SURGICAL INSTRUMENTS WHICH WILL PROBABLY BE REQUIRED FOR THE VARIOUS GYNÆCOLOGICAL OPERATIONS.

THE illustrations depicted in this chapter show, and the lists accompanying them enumerate, the surgical instruments which may be required for the performance of the various gynæcological operations. The theatre sister who is responsible for the instruments, sutures, and ligatures must be guided by the special requirements of each individual surgeon. If, therefore, she does not know which particular instruments, or what variety of ligatures and sutures the surgeon is in the habit of using for any special operation, she must ask him.

It is much better, in case of doubt, to prepare too many instruments than too few. The absence of some instrument which is required entails a delay in the operation while the instrument is taken from the instrument cupboard and sterilized.

On the other hand, there is a distinct disadvantage in putting too many instruments out, since the chance of one of them getting mislaid is greater. There are many cases on record, and a vast number not on record, in which some instrument, such as a pair of dissecting or pressure forceps, a pair of scissors or a towel clip has been inadvertently left in the abdomen. Such an instrument can be discovered by an X-ray examination of the patient, when the surgeon will have to re-open the abdomen. Otherwise its presence will be evident at a post-mortem examination or by its discharge through an abscess. The sister must be very careful, therefore, to make a note of the number of each kind of instrument set out before the

operation and at the close of the operation just before the peritoneum is sutured to verify this number, so that she may be able to answer the question of the surgeon which he always should ask, " Is the number of the instruments correct ? "

If any doubt arises subsequent to the patient leaving the operating theatre, and if the necessary apparatus is available, an X-ray examination of the abdomen will settle the matter.

For sutures and ligatures the author uses plaited silk and iodine tanned 30-day catgut.

It is found by experience that 20 yards of No. 4 silk and 6 yards of No. 2 silk are, as a rule, more than sufficient for any major operation of a gynæcological nature. Many surgeons use catgut entirely.

Rubber gloves will be required for the surgeon, house surgeon, dressers who are assisting, the instrument sister, and ward sister.

For the meaning of the names of the various operations the nurse is referred to the Glossary.

Vulval and Vaginal Cysts. (Fig. 49.)

A. Clover's crutch, in the absence of a proper operating table.
B. 6 Short pressure forceps.
C. 2 Scissors.
D. Vaginal retractor.
E, F. 2 Dissecting forceps, long and short.
G. 2 Ring forceps.
H. 4 Spring towel clips.
J. Catheter.
K. Scalpel.
L. Auvard's speculum.
M. 2 No. 5 half-circle needles.
N. 2 No. 9 ,, ,,
O. Bladder sound.
P. 2 Tubes catgut, No. 2.
Q. Gloves, 4 pairs.

If the cyst is in the posterior wall of the vagina, a vaginal retractor will be required.

The ring forceps are used as swab holders.

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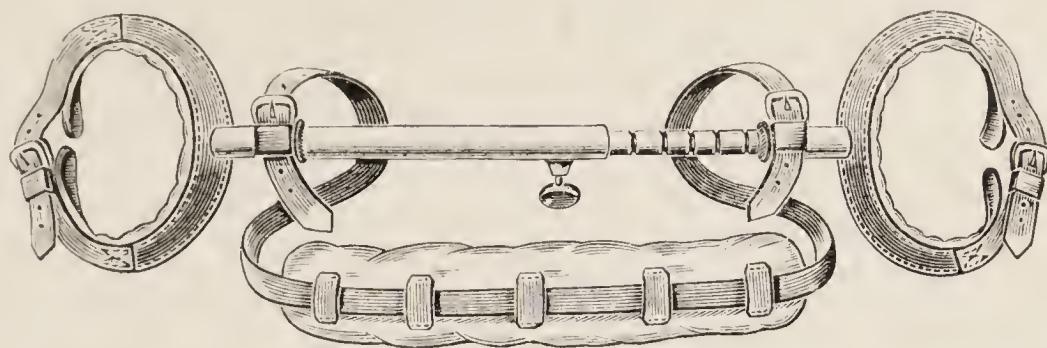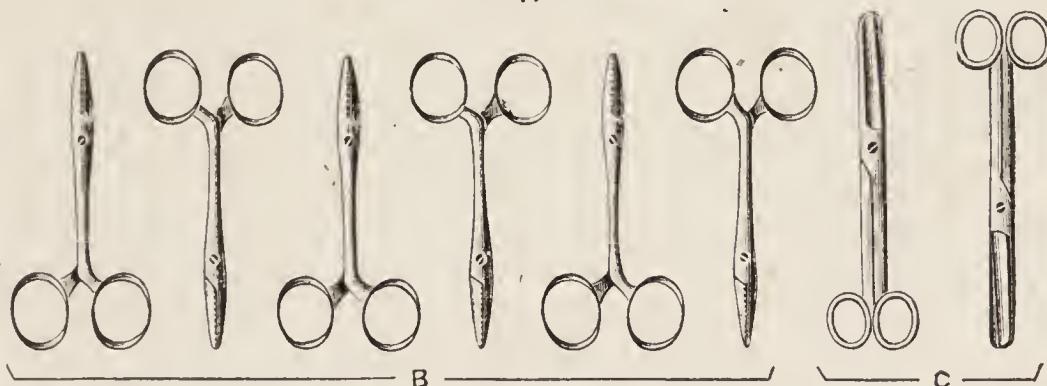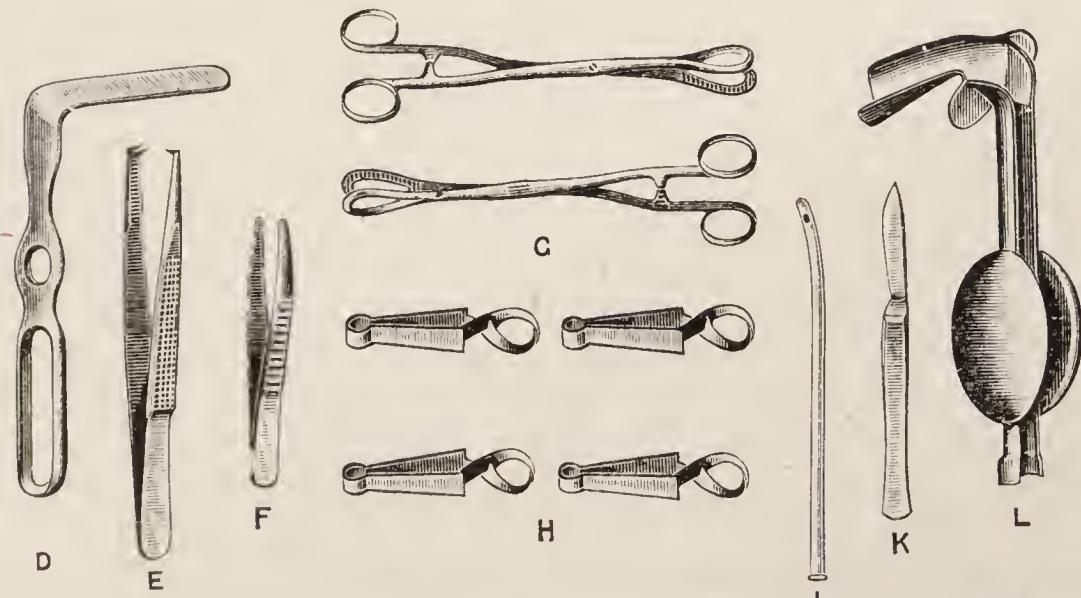
FIG. 49.

The Radical Operation for Malignant Disease of the Uterus. (Fig. 50.)

A.   12 Long pressure forceps.   N.   4 Spring towel clips.
A′. Scalpel.   O.   2 Tubes catgut, No. 2.
B.   3 Ring forceps.   P.   4 No. 5 half-circle needles.
B′. Vaginal clamp.   Q.   2 No. 9   ,,   ,,
C.   4 Long angular forceps.   R.   2 No. 13   ,,   ,,
D, E. 2 Dissecting forceps, long   S.   Bladder retractor.
       and short.   T.   Aneurysm needle.
F.   Probe.   U.   Worral's needle.
G.   Catheter.   V.   Gloves, 4 pairs.
H.   6 Short pressure forceps.   W.   India-rubber sheeting.
J.   Self-retaining retractor.   X.   Long scissors—angular.
K, L. Michel's clip apparatus.   Y, Z. 2 Scissors—straight, blunt.
M.   3 Reels silk, Nos. 6, 4, and 2.

Those surgeons who use Reverdin's needle, or some modification thereof, will require No. 13 needles only. Such surgeons may also use wristlets to hold the sutures and ligatures.

The self-retaining retractor depicted in the illustration is that devised by the author. The clamp is the Berkeley-Bonney pattern. The angular forceps are Kocher's. Two pairs of dissecting forceps will be required, one long for the operator and one short for the instrument sister, and two pairs of straight scissors likewise. The spring clips are to keep the body-cover in position. The Michel's clip apparatus is the author's pattern. The india-rubber sheeting is to protect the wound edges.

The object of the radical operation is to remove the uterus with the growth involving it, the Fallopian tubes, ovaries and upper part of the vagina, together with as much cellular tissue of the pelvis as is possible, including the lymphatic glands, so as to ensure, so far as possible, that all tissues infiltrated with cancer cells, which have spread from the growth, shall be extirpated. This means that the ureters have to be dissected clear of the growth, a dangerous procedure, since they may be cut, or may have to be cut, but more often they are stripped of a good deal of their blood-supply and so sometimes slough during the first 9 days of convalescence. Since the lymphatic glands may be adherent to the external or internal iliac veins the removal of these

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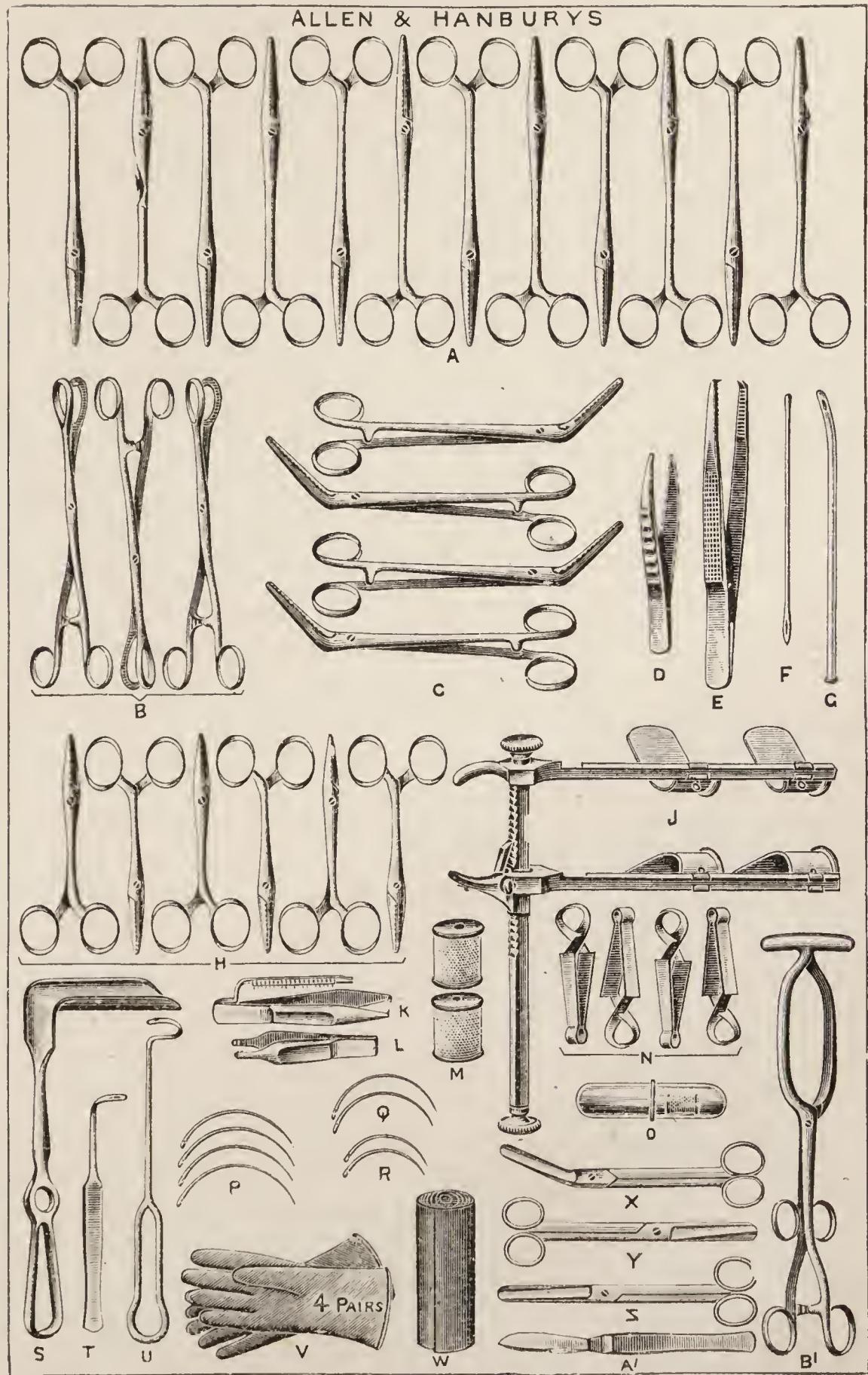
Fig. 50.

glands, in such circumstances, may be highly dangerous, since the vein sometimes may be wounded and have to be ligatured. The operation is associated with the name of Wertheim owing to his improvement of removing the growth in a bag of vagina, to reduce the danger of a local recurrence, by clamping the vagina well below the level of the growth and then dividing the vagina below the clamp.

Abdominal Hysterectomy — Myomectomy — Ovariotomy — Salpingectomy — Salpingostomy — Salpingo - Oophorectomy — Ventral Suspension — Shortening of the Round Ligaments—Cæsarean Section—Appendicectomy. (Fig. 51.)

A. 12 Short pressure forceps.

B. 3 Long pressure forceps.

C. 3 Ring forceps.

D. Volsellum forceps.

E, F. 2 Dissecting forceps, long and short.

G. Self-retaining retractor.

H. 4 Spring towel clips.

J. Probe.

K. 2 Scissors, blunt pointed.

L. Scalpel.

M, N. Michel's clip apparatus.

O. 2 Rubber drainage tubes $\frac{3}{4}$ in., $\frac{1}{4}$ in.

P. Catheter.

Q. 2 Tubes catgut, No. 2.

R. 2 Reels silk, No. 4, No. 2.

S. 4 No. 5 half-circle needles.

T. 2 No. 9 ,, ,,

U. 2 No. 13 ,, ,,

V. Gloves, 4 pairs.

In addition to the list of instruments enumerated, some surgeons wish bowel-clamps to be included, in case a portion of the bowel has to be resected. Those surgeons who use Reverdin's needle, or some modification thereof, will require No. 13 needles only. Such surgeons may also use wristlets.

Some of the operations indicated can easily be performed with only a few of the instruments mentioned in this list. A surgeon, however, cannot be certain, until he has opened the abdomen, of the exact condition which will be disclosed. The author found it more convenient, except in the case of the radical operation for cancer of the cervix, to work always with the same number and variety of instruments, and with them the most serious, as well as the most simple, of the operations enumerated above can be performed.

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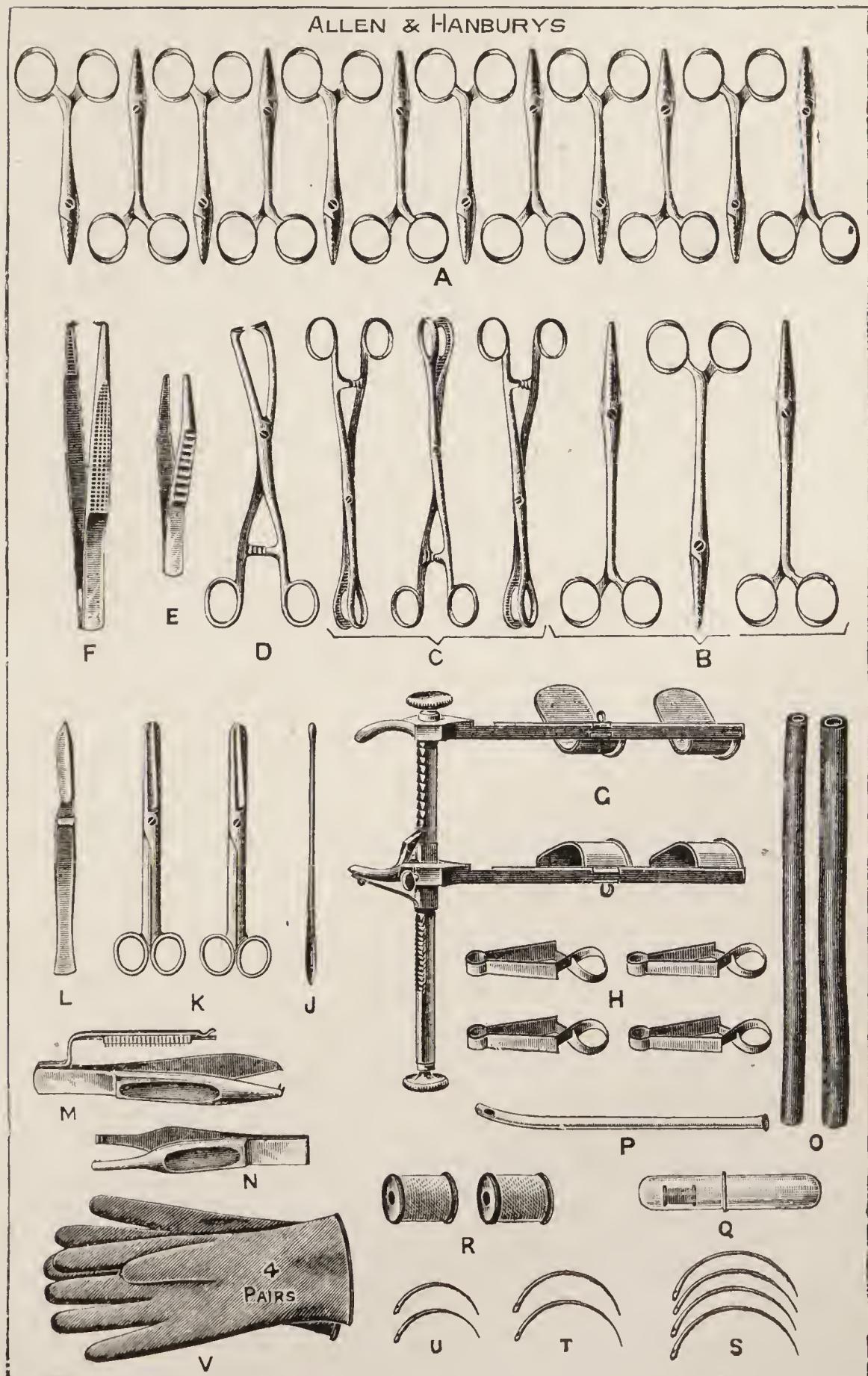
FIG. 51.

The probe is used to push the stump below the purse-string suture when the appendix has to be removed. A pair of Spencer Wells forceps will do equally well.

Hysterectomy is an operation to remove the uterus, which operation can be performed either through an abdominal incision or *per vaginam*. In vaginal hysterectomy the whole of the uterus is removed. In abdominal hysterectomy either all the uterus (total) or that portion above the level of the internal os (subtotal) is removed. Salpingostomy is an operation devised to restore the patency of Fallopian tubes which are closed by inflammation and which, therefore, render the patient sterile.

Vaginal Hysterectomy—Colpotomy.   (Fig. 52.)

A.   Clover's crutch, if a proper operating table is not available.
B.   6 Long pressure forceps.
C.   3 Ring forceps.
D.   Volsellum forceps.
E.   Auvard's speculum.
F.   Worral's needle.
G.   Bladder sound.
H.   Scalpel.
J.   2 Scissors, blunt pointed.
K.   4 Spring towel clips.
L.   Catheter.
M, N.   2 Dissecting forceps, long and short.
O.   2 Vaginal retractors.
P.   4 No. 5 half-circle needles.
Q.   2 No. 9   ,,   ,,
R.   Reel silk, No. 4.
S.   2 Tubes catgut, No. 2.
T.   Gloves, 4 pairs.

Some surgeons use Reverdin's needles and wristlets.

For the operation of colpotomy, that is opening the pouch of Douglas by an incision through the posterior vaginal fornix, the instruments indicated above will be required with the exception of the bladder sound, the pedicle needle, the No. 5 half-circle needles, and the silk. Three pairs of pressure forceps will suffice. The ring forceps are used as swab holders.

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A

B   C   D

F

G

H

E   J   K   M   N   O

L

P   Q   R   S   4 PAIRS   T
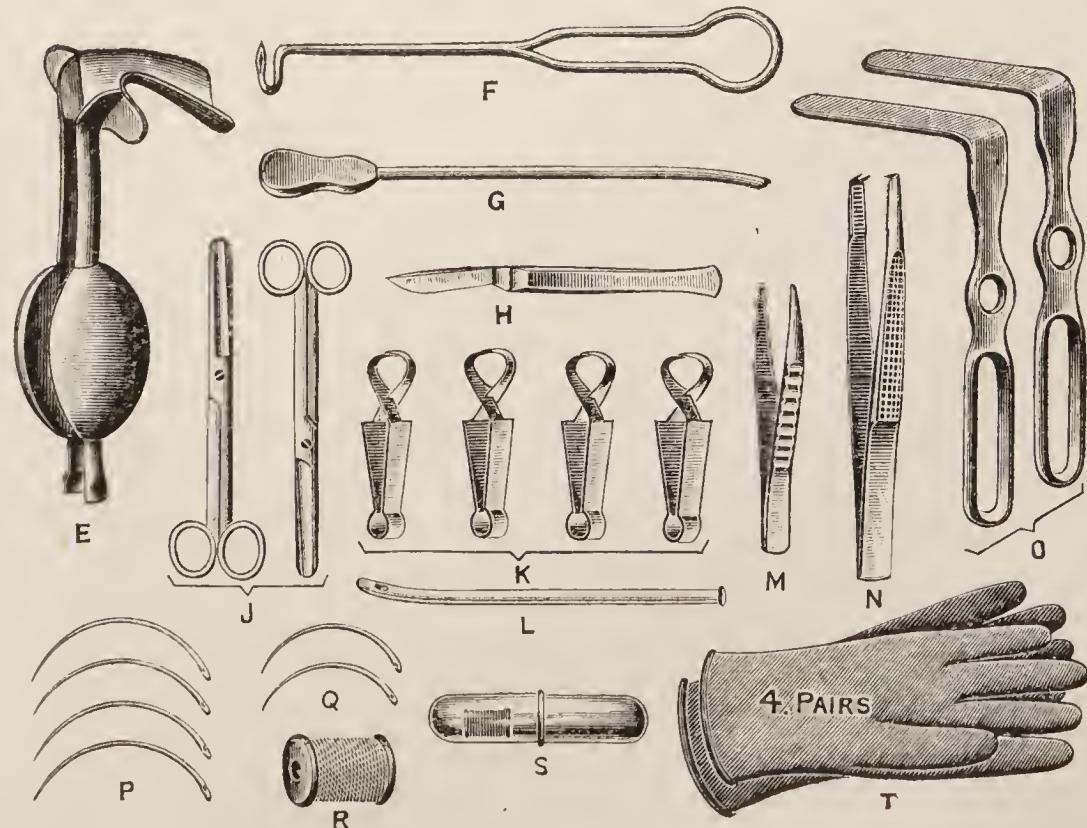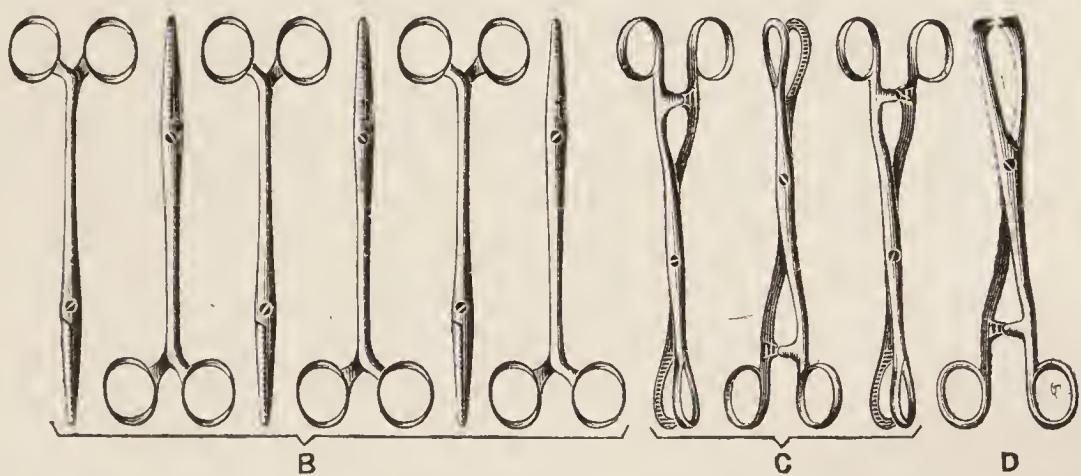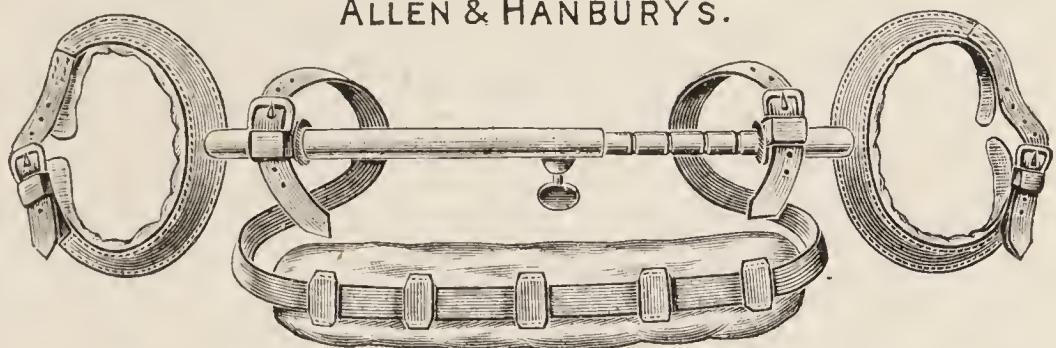
FIG. 52.

Dilatation of the Cervix and Curettage of the Uterus.
(Fig. 53.)

A. Clover's crutch, if a proper oper-
ating table is not available.

B, C. 2 Dissecting forceps.

D. 2 Volsellum forceps.

E. 2 Long pressure forceps.

F. 2 Ring forceps.

G. Metal dilators.

H. 4 Spring towel clips.

J. 2 Scissors, blunt pointed.

K. Tube catgut, No. 2.

L. Uterine sound.

M. Auvard's speculum.

N. 2 No. 9 half-circle needles.

O. Gloves, 4 pairs.

P. 2 Playfair's probes.

Q. Flushing curette.
Catheter (omitted in illustration).

If, during the dilatation, the cervix has been lacerated and the bleeding is free, the dissecting and pressure forceps and the needles and catgut will be required for suturing the lacerated edges.

The ring forceps are used as swab holders.

The pattern of the metal dilator depicted is Fenton's.

The cervix is dilated in some cases of dysmenorrhœa : to allow the interior of the uterus to be examined by the index finger so as to ascertain the presence, or otherwise, of a piece of placenta, a polypus, or malignant disease of the uterus ; to allow the curette to be used, and as a preliminary to the removal of uterine polpi or a submucous fibroid.

The operation of curetting consists in scraping the endometrium off the wall of the uterus. It is employed in cases in which the endometrium is very thick and in which there is excessive menstrual bleeding. Again, curetting may be successful in the treatment of sterility. The uterus is also curetted to obtain a specimen of the endometrium to ascertain whether it is the seat of cancer. Taking one case with another, however, curetting the body of the uterus is a disappointing operation, especially for the symptom of leucorrhœa, and one very much abused, quite apart from the fact that it may be a very difficult and dangerous operation, though supposed to be easy and safe. Difficulty may be encountered in dilating the cervix and the dangers are associated with a bad laceration of the cervix, infection of the uterus and perforation of that organ Except for a very few conditions, women are generally worse after a curetting than before, some

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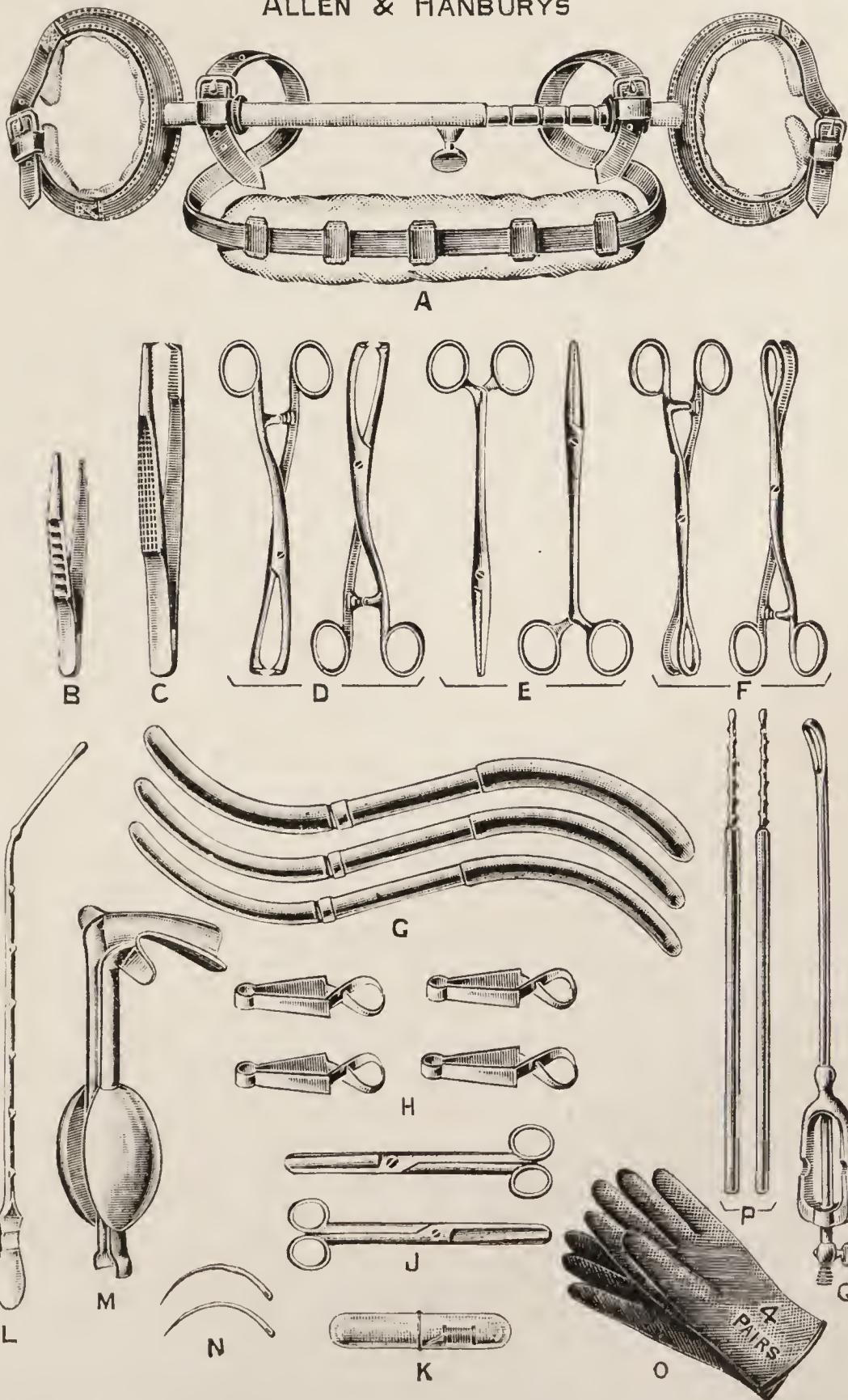
FIG. 53.

of them very much worse, though curiously enough, this is no reason for again curetting them !

Perineorrhaphy — Colporrhaphy — Trachelorrhaphy —Amputation of the Cervix—Removal of a Sub- mucous Fibroid, of a Fibroid or Mucous Polypus. (Fig. 54.)

A. Clover's crutch, if a proper operating table is not available.
B. 3 Short Kocher forceps.
C. 6 Short pressure forceps.
D, E. 2 Dissecting forceps, long and short.
F. Scalpel.
G, H. 2 Scissors, sharp and blunt pointed.
J. Volsellum forceps.

K. 2 Ring forceps.
L. Auvard's speculum.
M. Bladder sound.
N. 2 No. 5 half-circle needles.
O. 2 No. 9 ,, ,,
P. 3 Tubes of catgut, 2 No. 2, 1 No. 3.
Q. 4 Spring towel clips.
R. Catheter.
S. Gloves, 4 pairs.

For the operation of trachelorrhaphy, amputation of the cervix, removal of a sub-mucous fibroid or polypus metal dilators will be required.

The ring forceps are used as swab holders. The opera- tion of perineorrhaphy consists in restoring, so far as possible, the perineal body between the lower inch of the vagina and rectum and, in many cases, also remedying the bulge of the lower part of the rectum (rectocele) with which a deficient perineum is often associated. The operation is concerned with restoring the damaged pelvic floor by suturing the levatores ani, the adjacent connective tissue and removing the excess of vaginal walls, and reducing the size of the vaginal orifice.

Anterior colporrhaphy is indicated when the woman is troubled by a swelling consisting of part of the bladder covered with anterior vaginal wall which bulges through the vaginal orifice and which may be associated with difficulty of micturition. The operation consists in removing the excess of the anterior vaginal wall, separating the bladder from the supra-vaginal cervix, pushing it up and inserting sutures below it so that it cannot again bulge.

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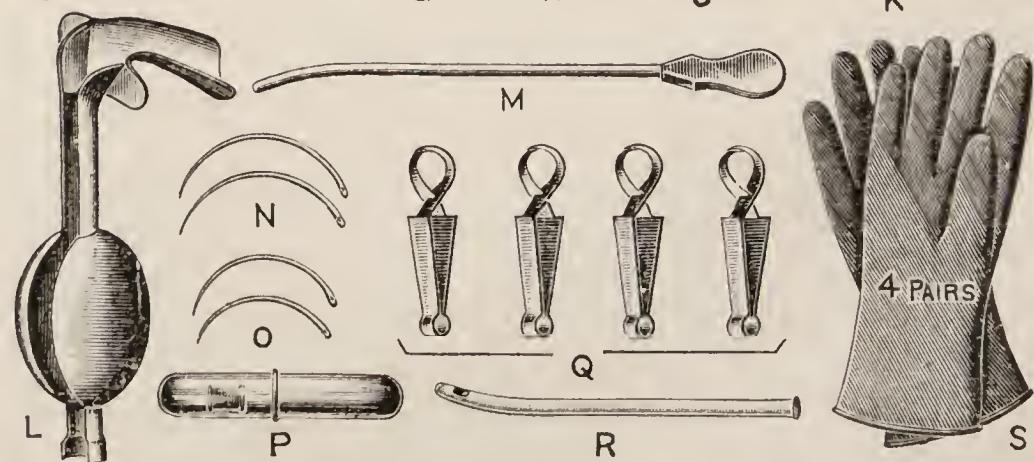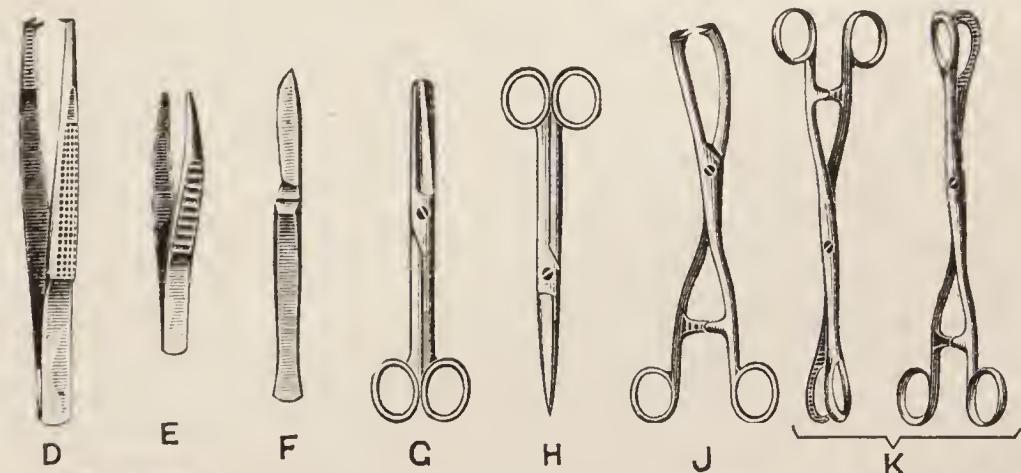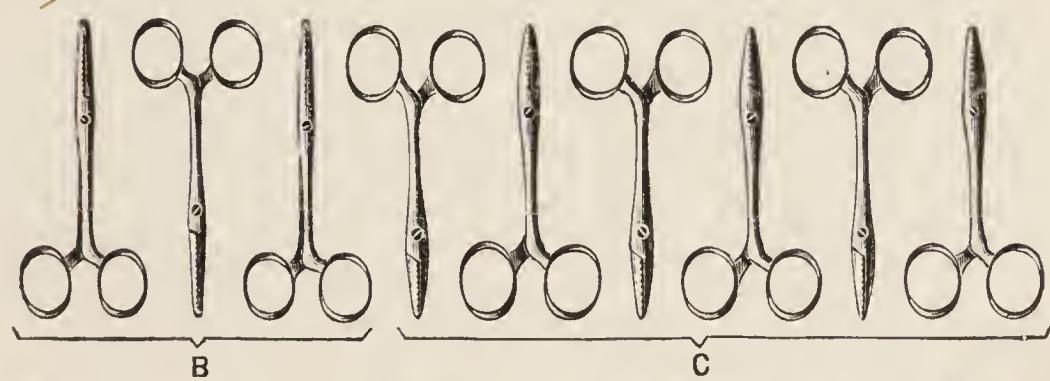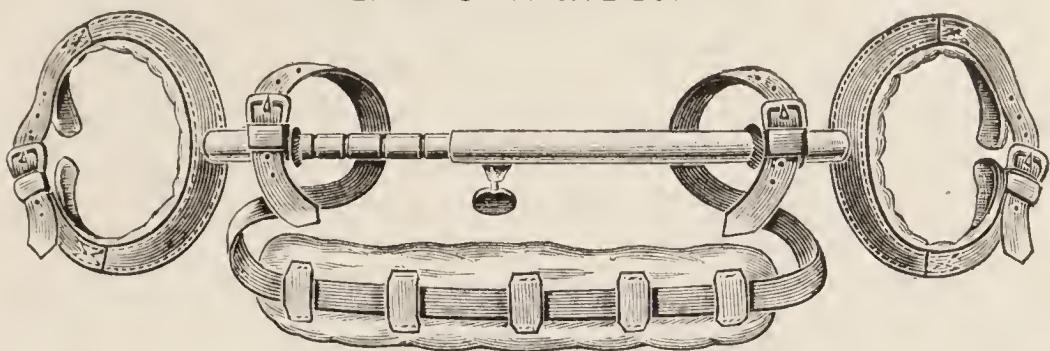
FIG. 54.

Trachelorrhaphy is performed in those cases in which leucorrhœa is profuse and due to a chronic cervicitis associated with a split cervix. The split cervix is repaired by making its edges raw and then suturing them together. If the cervix is badly split the best treatment is to amputate it. Trachelorrhaphy is also performed in some cases of sterility.

Vesico-Vaginal and Recto-Vaginal Fistulæ. (Fig. 55.)

A.	Clover's crutch, if a proper operating table is not available.	
B, C.	3 Scissors—2 blunt pointed, 1 sharp pointed.	
D.	4 Long pressure forceps.	
E.	Scalpel—narrow blade.	
F, G.	2 Dissecting forceps, long and short.	
H.	Vaginal retractor.	
J.	Catheter.	
K.	Cleft palate needle-holder.	
L.	2 Ring forceps.	
M.	Bladder sound.	
N.	Auvard's speculum.	
O.	2 No. 2 cleft palate needles.	
P.	2 No. 9 half-circle needles.	
Q.	4 Spring towel clips.	
R.	2 Tubes catgut, No. 1, No. 2.	
S.	Gloves, 4 pairs.	

In the absence of a cleft palate needle-holder, a long pressure forceps can be used. A vesico-vaginal fistula, high up in the anterior fornix is difficult to close. It is easier in such a case to use cleft palate knives, forceps, needle-holders, and needles.

The vaginal retractor will be required for a recto-vaginal fistula. If the surgeon elects to use a Reverdin's needle when performing any vaginal operation, the ordinary needles may not be required.

The constant passage of urine or fæces into the vagina leads to such inconvenience and misery that, if possible, the hole connecting the various organs must be closed by operation. It is, however, only when the cause of the fistula has been traumatic that an operation is indicated, since if the fistula is due to cancer the condition is hopeless, and if to syphilis the fistula will close with adequate drug treatment.

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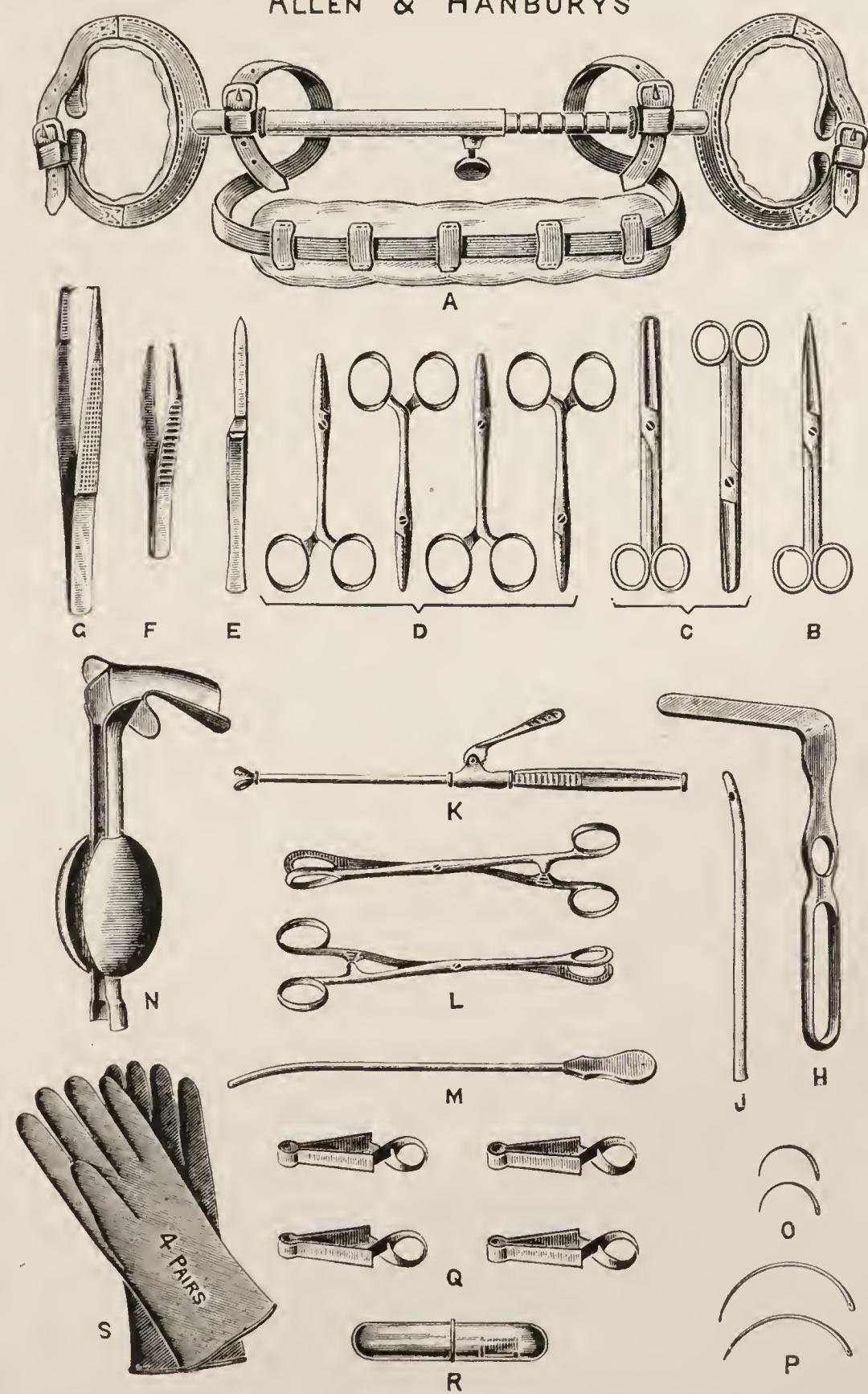
FIG. 55.

INSERTION OF RADIUM FOR CANCER OF CERVIX UTERI. (Fig. 56.)

A.   Clover's crutch, if an operating table is not available.
B.   Sims's speculum.
C.   Auvard's speculum.
D.   4 Spring towel clips.
E.   Curette.
F.   Ring forceps.
G.   Dissecting forceps.
H.   Volsellum.
J.   Uterine sound.
K.   Fenton's dilators 1 to 6.
L.   Flat applicator covered with india-rubber bag.
M.   Tubular applicator covered with india-rubber tube.
N.   Silkworm gut.
O.   Silk.
P.   Gloves.
       Gauze.   Specimen bottle.   Benzine.   Tincture of iodine.

So as to ensure that the presence of cancer of the body or cervix of the uterus is not overlooked when a patient is to be treated with radium for chronic metritis, a sharp curette is necessary ; also to dig a piece out of the neck of the uterus in cases of cancer so that it can be microscoped in order that there shall be no doubt as to the growth being cancer when estimating the cure rate.   The ring forceps is to insert the gauze into the vagina after the applicators containing the radium salt, or radon, have been inserted.   The india-rubber bags are to cover the applicators to prevent secondary radiation.   The silk to tie the covering on, and the silkworm gut to tie onto the intra-uterine applicator so that it can be pulled out.   The benzine is used as an antiseptic to swab out the vagina in cases of cancer.   The tincture of iodine for the same purpose in cases of chronic metritis.

The specimen bottle is required to hold the specimen which has been removed for microscopical examination.

To prevent the applicator slipping out of the uterus, and the vaginal applicators slipping away from the growth, the vagina is plugged with gauze, after which a T bandage is applied.   In the case of the vaginal applicators the gauze is also used to separate them from the vaginal wall so as to obviate, so far as possible, the risk of rectal or vesical fistulæ.
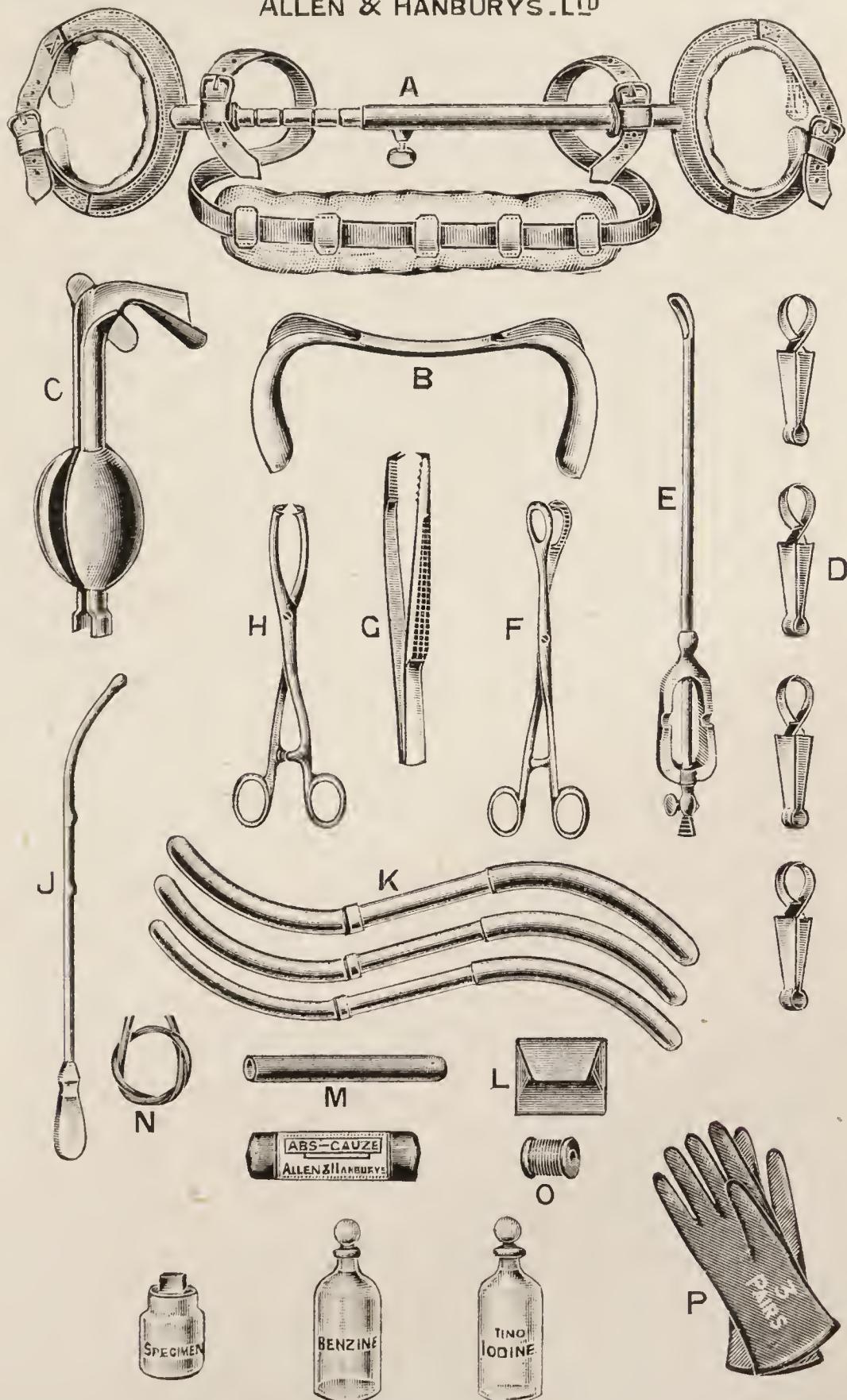
FIG. 56.

Preparation of the Patient.—As for a curetting.   In addition a label must be attached to the patient on which is written the number of applicators and containers inserted.

Duties of the Theatre Sister or Nurse.—The instruments are sterilized. The radium salt, or radon, will be delivered to the sister in an intra-uterine applicator if the case is one of chronic metritis, or in an intra-uterine applicator and vaginal applicators if the case is one of malignant disease. Silkworm gut is threaded through the eyelets of the intra-uterine applicator and tied in, after which this applicator is inserted in a special rubber bag, the open end of which is tied with silk, the unattached ends of the silkworm gut hanging free ; the whole is then sterilized by boiling and placed in a sterilized tray ready for use. The vaginal applicators are inserted into rubber bags which are tied on securely with thread, the ends of the thread being left long and hanging free.   These applicators are sterilized in the same way.

For the treatment of chronic metritis the radium, or radon, is inserted into the cavity of the uterus only ; for the treatment of cancer it is inserted into the uterus and also into the fornices of the vagina, and if these are obliterated then up against the growth.

If the sister, or nurse, is directed to remove the applicators, she must make a note of the hour they have to be removed.

After Treatment.—If a patient is treated for chronic metritis, she is able, as a rule, to return home on the 3rd day if she wishes.

As a rule one dose of radium, or radon, is sufficient in cases of chronic metritis ; occasionally two doses are required. Rarely the treatment fails or is successful only for some months.

When cancer of the cervix is being treated the patient is kept in the hospital, or nursing home, for 14 days, the second dose being given at the end of a week.   She is allowed to get up after the 4th day, if there is not any temperature, and leave 4 days after the third application, which is made 3 weeks after the second.

Many patients complain of headache and nausea following the use of radium, or radon, and its use is always followed by a brownish discharge for some weeks, and a few patients have a slight temperature for a day or two.

Dangers of X-rays.

Nurses.—In the modern X-ray therapy department, the nurse does not run any risk. She sits behind a leaded glass window in full view of her patient and does not enter the room until the radiation beam has been switched off. The necessity for ample protection of walls, as provided for in the Recommendations of the X-ray and Radium Committee (now the International Standard of Protection), is well known and always adopted by the builder. The blood of the nurses should be examined every 6 months by a competent physician.

Patients.—There is a distinct danger associated with medium or high voltage therapy, unless given by an expert, namely, burns, which are very serious and take many months to heal. Another danger is that a patient may be treated for chronic metritis or fibroid of the uterus by X-rays before a microscopical examination of the specimen obtained by a previous curetting has been made to discover whether the bleeding was due to malignant disease. Moreover, some pelvic or abdominal tumours may appear on clinical examination to be fibroids when they are really ovarian or inflammatory in nature.

Dangers of Radium.

Nurses.—The danger of over-exposure to radium, or radon, can be avoided by the provision of efficient protection and suitable working conditions. The known ill-effects on people handling radium, or radon, to be guarded against are :—

(a) Injuries to the superficial tissues of the hands due to the destructive action of the beta-rays, which may lead to cancer, or short of this to permanent damage.

(b) Radio-sensitivity of the vascular system, and of the internal organs, especially of the ovaries and testes.

The detection of such injuries is most important since their early manifestations are often unrecognized.

In order efficiently to protect nurses :—

1. If it is part of a nurse's duty to insert radium, or radon, into applicators a screen of lead, not less than 1 inch in thickness, should be erected on the bench, on

which the tubes, needles, and surface applicators are being prepared, between her body and her hands. Proximity to the radium, or radon, should occur only during the manipulations and for as short a time as possible.

2. Nurses engaged in such work should be on duty in the department not more than 6 months at a time, and should have extra leave off duty.

3. The radium, or radon, should be carried from place to place in long handled boxes lined on all sides with 1 cm. of lead.

4. Periodic tests should be made every 3 months of the blood of any nurse handling radium, or radon, by a competent physician, who will probably be more conversant, perhaps, with the early changes therein, if any, than a radium officer.

5. In order to protect her hands from beta-rays, reliance must be placed, in the first instance, on distance. The radium, or radon, containers and applicators should be handled with a long forceps, she should wear rubber gloves, and all manipulations should be carried out as rapidly as possible.

Patients.—There are three dangers to patients associated with the use of radium, or radon : the loss of a needle or tube containing the radium salt, or radon ; burning of the patient, and septic infection.

1. The container containing the radium salt may be lost by being thrown away in the excreta or dressings, or an applicator may be lost, and it is for this reason that some of the above rules were made. Radium may be lost, temporarily, if the material used for pulling out the containers breaks, in which case great difficulty may be experienced in removing the container if it is buried in the tissues and much inconvenience if it is in the uterus, necessitating, perhaps, another anæsthetic. Moreover, the patient may be nervous, or troublesome, and refuse to allow any further trial to be made to remove the container. The author once had such an experience. The silk attached to a bunch of needles, which were used in those days, buried in a cervical growth,

broke when the sister was pulling on it to remove them. The radium salt in use was not only worth £3000 but would also have killed the patient by opening a large blood-vessel if left *in situ*. The patient refused to have any further treatment, and in spite of the entreaties of the sister, nurses, resident medical officer and house surgeon, the patient got up, dressed, and expressed her intention of leaving the hospital after dinner. The author arriving at about that time persuaded the patient to let him examine her in the dark room under X-rays. The patient agreed to this, and the needles were observed to be lying in the broad ligament, having moved from their original position. With a little more persuasion the author was allowed to pass a pair of forceps up the vagina, through the growth, which was very advanced, and into the broad ligament. The end of the forceps could then be seen as well as the bunch of needles, which were grasped and removed. It was after this experience that silkworm gut for securing the uterine applicators was substituted for the silk.

2. If the uterine applicator slips out of the uterus into the vagina the latter may be burnt, and if the packing becomes loose and the vaginal applicators slip away from the growth, a vesico-vaginal or recto-vaginal fistula may result.

3. Septic infection is a serious complication and may occur if the patient has some septic focus before the application of the radium salt, or radon. Thus if the patient is found to have a dilated Fallopian tube or tubes (pyosalpinx), the radium treatment should not be commenced until the diseased tubes have been treated surgically. Moreover, even if the Fallopian tube be not dilated but merely septic, the application of radium salt, or radon, in cases of cancer of the uterus, may lead to a pyosalpinx forming and a resulting peritonitis, which conditions have to be dealt with surgically. The cause of most of the deaths following the intra-uterine application of radium, or radon, is septicæmia or peritonitis.

WHOLE-TIME WORKERS.

The following working conditions are recommended by the X-ray and Radium Protection Committee :—

1. A separate room should be provided for the ' make up ' of the tubes, needles, and surface applicators, and this room should be occupied only during such work.

2. Not more than seven working hours a day.

3. Sundays and two half-days off duty each week, to be spent as much as possible out of doors.

4. An annual holiday of one month, or two separate fortnights.

5. Sisters and nurses employed as whole-time workers in X-ray and radium departments should not be called upon for any other hospital service.

A sister or nurse who is working in a Radium Unit may, among other duties, have to—

1. Sterilize the tubes, needles, and applicators, which is done by boiling them. Mercury and iodine solutions must never be used for sterilization because the metal will be injured. Radon seeds should not be boiled, but should be sterilized in dettol or some similar solution.

2. Clean the tubes, needles, and applicators after use, which can be accomplished with acetone, benzine, chloroform, ether or petrol.

Duties of a Ward Sister or Nurse.—

1. Examine all dressings removed when the tubes, needles, and applicators are taken out, as a precaution against loss.

2. Keep the radium in a safe repository after its removal until such time as the radium officer attends to take it away to his radium safe. In all properly organized radium units a safe in the ward, or closely adjacent, is provided for this purpose. In some hospitals also the dressings are put in a special pail, painted red, and are not thrown away until the radium officer has applied a physical test, to ensure that there are not any containers in the dressings.

3. She must never let a patient, in whom radium or radon has been inserted, get out of bed to go to the lavatory, or if the patient is being treated in the out-patient department with superficial applications she

must not let the patient go to the lavatory without first removing the radium or radon, reapplying it on the return of the patient.

4. She must at once inform the sister or doctor concerned if the dressing, such as the gauze when vaginal applicators are used, comes out, or partly out. If, for instance, the applicators applied to the neck of the uterus slip away from the growth because the packing is loose the radium emanations may burn the vaginal walls with the result that recto-vaginal or vesico-vaginal fistulæ are formed. Such fistulæ may not make their appearance for some months.

5. She must not throw away or destroy any dressings removed from the patient until all the applicators and containers have been accounted for.

6. She must examine all excreta (urine and fæces) before disposing of them in case an applicator or container may be contained therein.

7. She must check the number of containers and applicators, after they have been removed, with that written on the label attached to the patient. This rule does not apply to the nurse unless she has been directed to remove the containers or applicators.

8. Any discrepancy between the number of containers or applicators removed and that entered on the label must be at once reported to the surgeon.

9. She must remember that radium is a most expensive metal. Every precaution, therefore, must be taken to prevent its loss if only because radium has to be insured, and the present low rate of insurance granted to hospitals is based on the assumption that the greatest care will be taken; any considerable loss, therefore, might result in the premium of insurance being raised for all hospitals, and hospitals are badly enough off for funds as it is.

Cystoscopy. (Fig. 57.)

The following articles are required for cystoscopy :—

- A.   Clover's crutch, if a proper operating table is not available.
- B.   Cystoscope and battery.
- C.   Syringe for washing out the bladder.
- D.   Tube and funnel.
- E.   Syringe for applying novocaine to the urethra.
- F.   Glass measure.
- G.   2 Kidney trays.
- H.   Gloves.
      Solution of novocaine.
      Jar of glycerine.
      Can of lotion.

The surgeon will use either the tube and funnel or the bladder syringe for injecting water into the bladder. The urethral syringe and novocaine are for a local anæsthetic if the surgeon wishes.

Method of Sterilizing the Cystoscope.—The cystoscope is placed in 1 in 60 carbolic acid solution for 30 minutes and after being used it is carefully flushed through with cold water to remove any blood clots which may be present, and then placed in 1 in 60 carbolic acid solution for 15 minutes, after which it is rinsed through with methylated spirit before being dried, all screws, caps and washers being removed.

Duties of the Nurse.—The lamp of the cystoscope should be tested before handing the instrument to the surgeon. The patient must be placed either in the lithotomy position, or on her back with a sand bag under her pelvis.

The temperature of the solution to be used for washing out the bladder is 100°. F. The nurse will have to keep the tubes and funnels filled, or if syringes are used she may be directed to fill these. If the cystoscope is being inserted into the bladder with the patient on her back, the nurse, by arranging two macintoshes, one on the abdomen and the other across the knees, will ensure that the patient does not get wet from the drippings.

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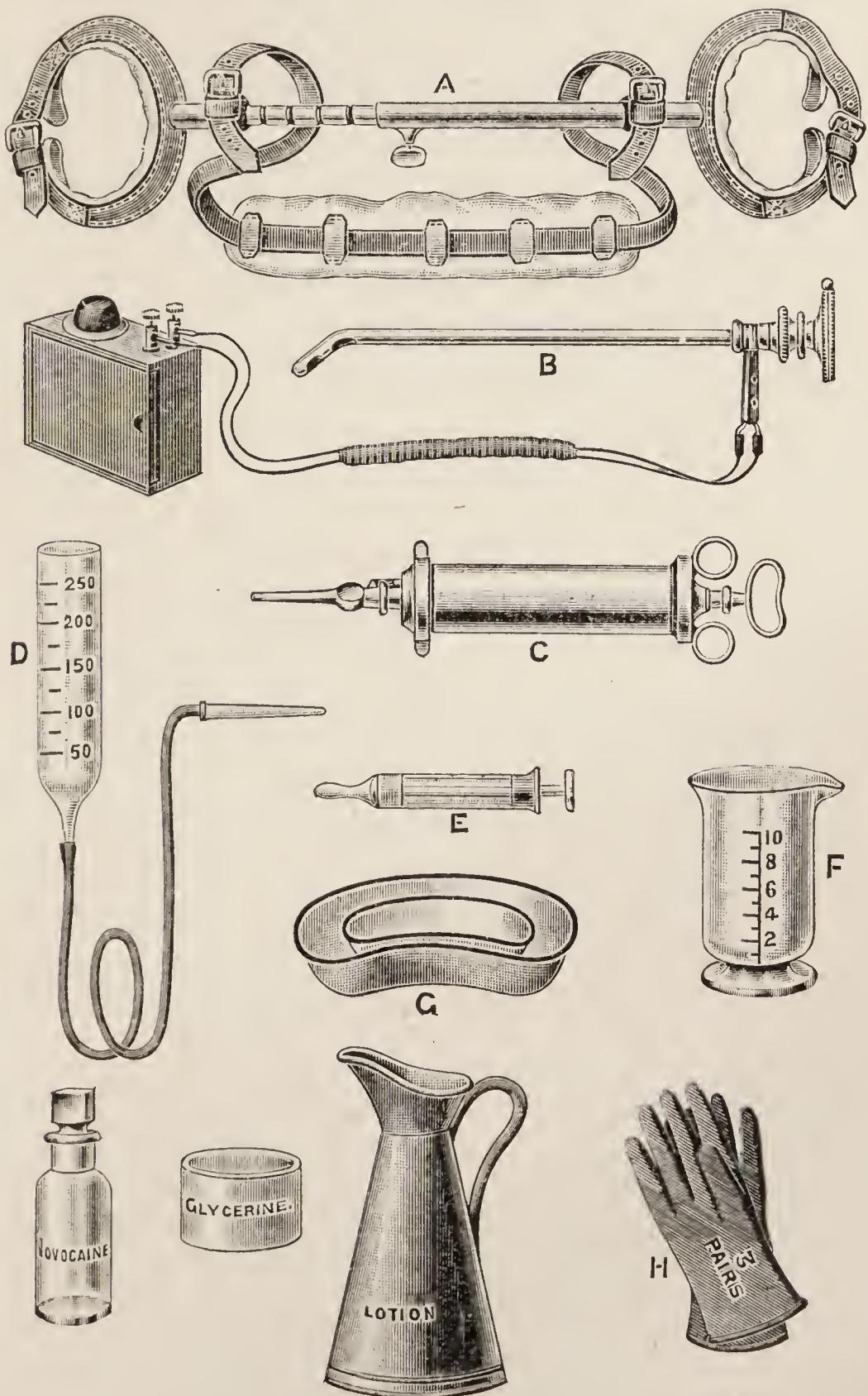
FIG. 57.

NOVARSENOBILLON INTRAVENOUS INJECTION. (Fig. 58.)

Novarsenobillon is a yellow powder, and has to be dissolved in 10 c.c. of freshly distilled water, or 10 c.c. ampoules of freshly distilled water if these can be obtained.

Stabilarsan.—This form of salvarsan is put up in solution in 10 c.c. ampoules ready for use.

Surgical spirit does not discolour the skin like tincture of iodine, and so it is easier to see the vein.

The glass syringe is for the arsenic solution. The 2-inch needle is to draw up the solution from the medicine glass. The 1½-inch needles are to inject the solution into the vein. The tourniquet is applied to the upper arm to make the veins stand out. The forceps is to secure the tourniquet. The hypodermic syringe is held in readiness for any vascular symptoms which may arise.

Duties of the Nurse.—The syringe and needles are sterilized by being placed in cold water which is then brought to the boil, or they may be kept in a jar of methylated spirit. The points of the injection needles must be sharp, and wires must be kept in the needles when not in use. If the syringe and needles have been kept in spirit they must be well washed through with distilled water before use. The nurse may be directed to release the tourniquet.

In the majority of cases the first dose is 0·3 grm. and then 0·6 grm. a week later. Each subsequent dose is 0·9 grm.

Preparation of the Patient.—The urine should be tested for albumin, and if this is present the doctor must at once be informed. An aperient is given the night before followed by Epsom salts, or an enema, in the morning. It is very necessary that the bowels should be acting quite regularly, if not, a preliminary treatment with this object in view must be prescribed. Food is not to be given for 2 hours before the injection.

Reactions.—Rarely during, or immediately after, the injection of novarsenobillon certain vascular disturbances arise. The face becomes flushed, the pupils dilate, the voice

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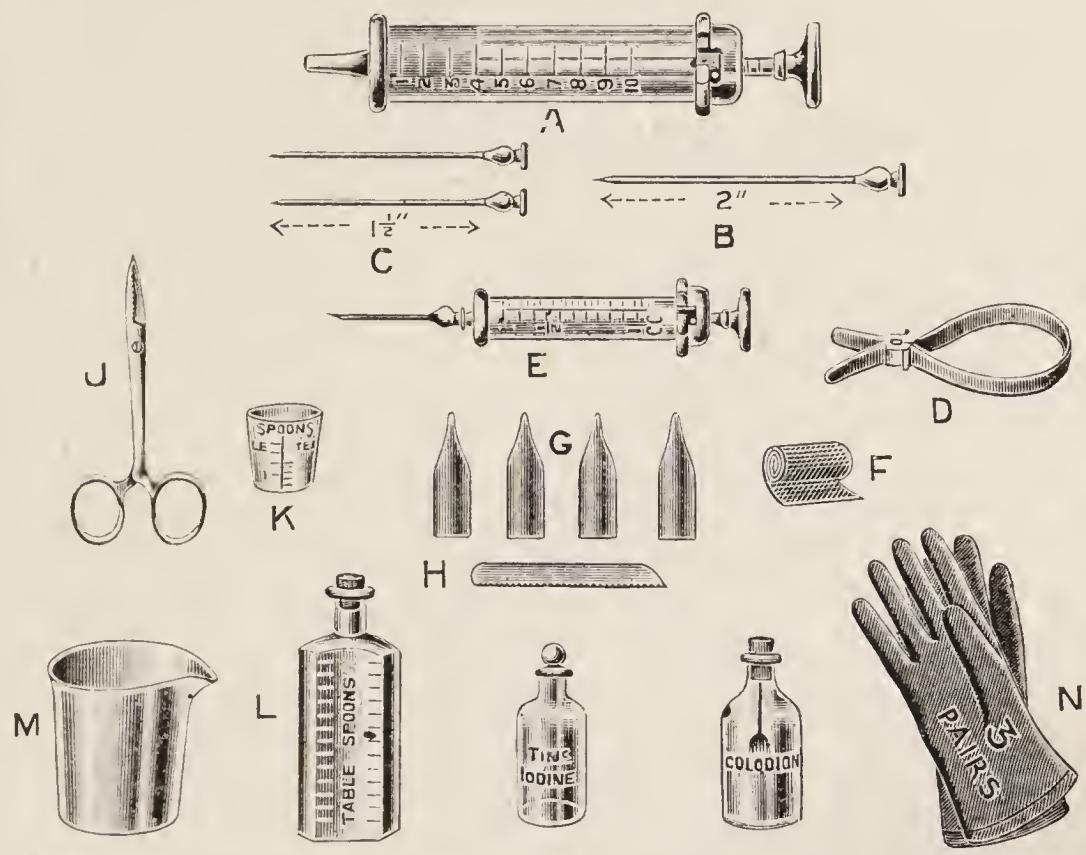
FIG. 58.

A. Syringe, glass 10 c.c.
B. Syringe needle, 2 inches long, with wide bore.
C. Syringe needle, 1½ inches long, with narrow bore.
D. Tourniquet.
E. Hypodermic syringe, containing 1 c.c. adrenalin (1 in 1000).
F. Bandage.
G. Novarsenobillon, ampoules of.
H. File to open ampoules.
J. Spencer Wells forceps.
K. Glass measure.
L. Glucose mixture.
M. Beaker of warm sterile distilled water.
N. Gloves.
   Tincture of iodine, or surgical spirit.
   Collodion and brush.

10

is husky, there is tightness of the throat and pain in the chest ;
such symptoms are not serious. More rarely still dyspnœa,
shivering, palpitation, vomiting and occasionally coma may
supervene. Patients of plethoric type are most likely to have
such reactions, and in them a prophylactic injection of adren-
alin, 1 c.c., is given 5 minutes before the injection. In some
patients a taste of garlic supervenes following the injection,
in which case the patient should be rested before being sent
home.

There are certain, but well-marked, symptoms which
may occur up to 2 days after the injection, and late symptoms
may arise up to 4 weeks. These concern the doctor.

INTRA-UTERINE INJECTION OF GLYCERINE.

This method is used in cases of puerperal toxæmia and
also for the treatment of pyometra.

The glycerine is placed in a jug and the jug in a bowl of
water and so boiled for 30 minutes, and then allowed to cool.

The glycerine is injected into the uterus by means of a
20 c.c. syringe and through a catheter which has originally
been placed in position by the doctor. If a soft rubber
catheter is used the end projecting through the vulval orifice
is stitched to a labium majus. If a gum elastic catheter is
used it is kept in position by strapping. The amount in-
jected varies. Some doctors direct the nurse to inject
2 ounces of glycerine twice daily, others 1 ounce every
4 hours. How long this treatment should be continued de-
pends on the directions given to the nurse.

DIATHERMY.

Instruments.—In addition to the Diathermy apparatus, the
instruments required will be chosen by the surgeon. The
instruments must be sterilized by the usual method.

Preparation of the Patient.—The patient is prepared as for
any other operation, on that portion of the body in which the
diathermic treatment is to be carried out.

To Clean the Electrodes.—Scrape any blood clot which has accumulated on the electrodes and then spark the gap.

CAUTION.

A nurse would not be accused of exceeding her duties if she reminded the anæsthetist, if he had forgotten, to remove the ether bottle from the anæsthetic wagon.
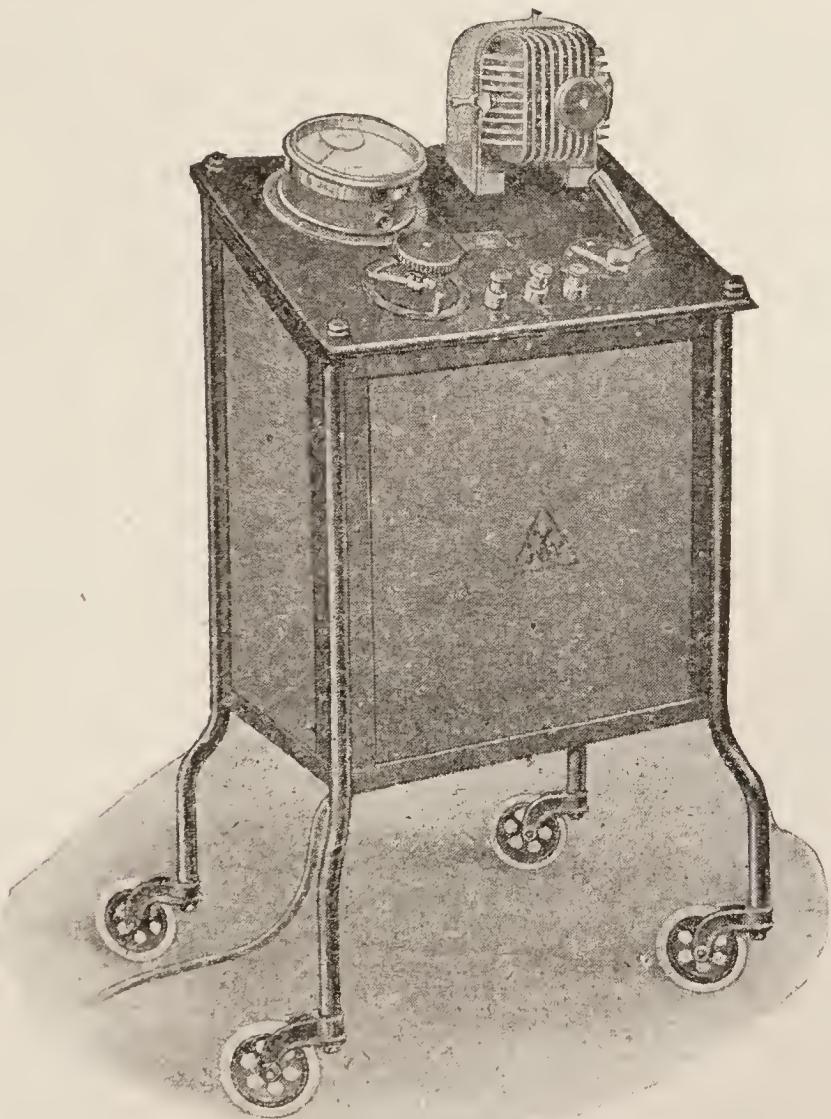
FIG. 59.—DIATHERMY APPARATUS.

The nurse may be directed to apply the diathermy pad to the abdomen or thigh by the surgeon. The pad must be placed between pieces of lint soaked in normal saline solution.

The handle of the electrode should be covered with a sterile towel.

Removal of a Urethral Caruncle. (Fig. 60.)

A. Clover's crutch, if a proper operating
        table is not available.
B. Actual cautery.
C. Bladder sound.
D. Dissecting forceps.
E. Scissors, sharp pointed.
F. Gloves, 3 pairs.
G. 4 Spring clips.
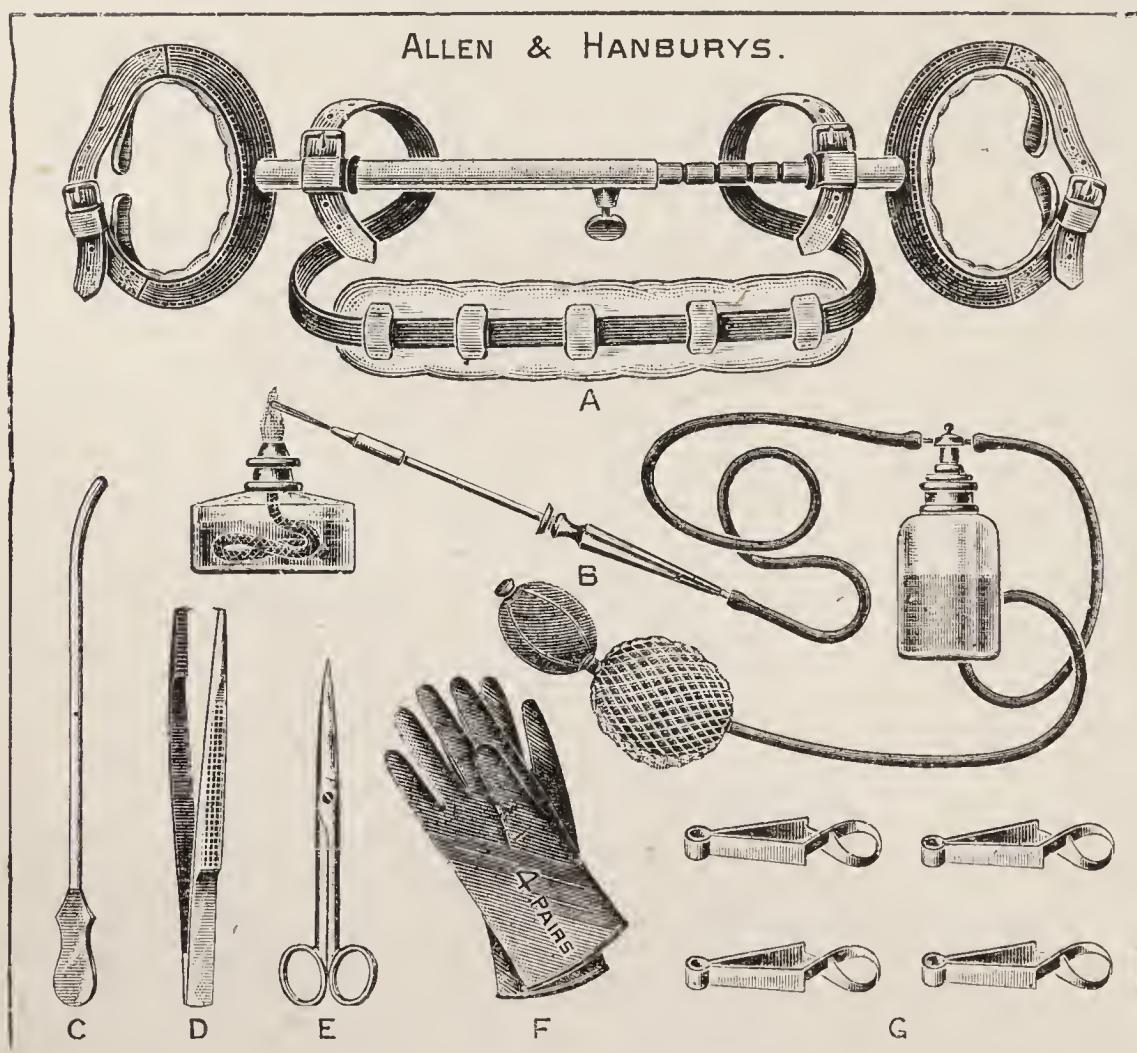
FIG. 60.

The caruncle having been removed with scissors the bleed-
ing base is cauterized, not because of the bleeding but to ensure
that every portion of the caruncle is destroyed, recurrence
otherwise being common.   Before handing the cautery in a
sterilized towel to the surgeon, the sister must have satisfied
herself that the point of the cautery can be heated, and that
this heating can be kept up when the bellows is squeezed.
Before starting to pump the methylated spirit up the cautery,
its tip should first be heated in a flame till it is red hot.

Out-Patient Department. (Fig. 61.)

A. Sims's speculum.
B. Rectal speculum.
C. 2 Ring forceps.
D. Ring pessaries.
E. Hodge pessaries.
F. Uterine sound.
G. 2 Playfair's probes.

H. Napier's cup and stem
   pessaries.
J. Bladder sound.
K. Catheter.
L. Volsellum forceps.
M. Ferguson's speculum.
N. Rubber gloves.

Solution of biniodide of mercury (1 in 2000).
Absorbent wool swabs in a bowl.
Absorbent wool.
Iodized phenol ; carbolic acid, a saturated solution of picric acid in
   rectified spirit.
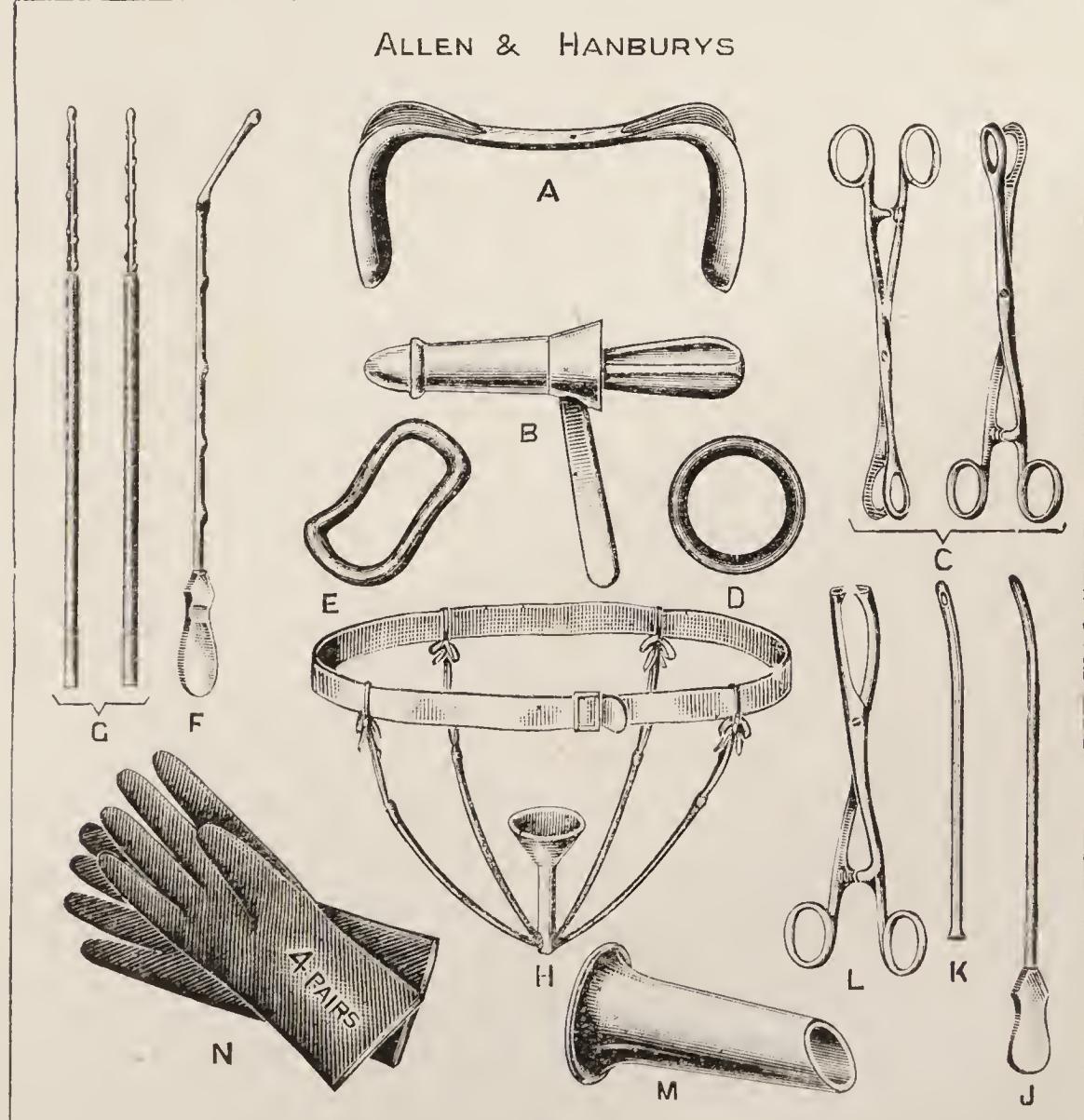
FIG. 61.

CHAPTER XXVII.

DUTIES OF A NURSE JUST BEFORE AND JUST AFTER AN OPERATION.

1. Care of the patient during her transit from the ward to the anæsthetizing room.

2. Care of the patient during her transit from the operating theatre to the ward.

3. Care of the patient in the ward.

Care of the Patient during her Transit from the Ward to the Anæsthetizing Room.

1. A canvas stretcher and a macintosh covered by two towels are placed on the ambulance.

2. Prior to the patient being placed on the ambulance any dental plate she may have in her mouth should be removed and any hairpins in her hair taken out. She should also leave her handkerchief behind.

3. The patient is lifted onto the ambulance and covered with two blankets.

4. The doors of the anæsthetizing room must be kept closed so that the patient, when she is wheeled into it, will not be able to see the interior of the operating theatre. The sight of the necessary preparations, of the presence in the theatre of students or of visitors, perhaps of an operation just being concluded, or of blood on the towels or floor, will be most alarming to many patients, and it is important to avoid causing her any mental distress.

5. On the arrival of the patient in the anæsthetic room her hair should be covered by a sterile towel folded round

the back of her head and pinned in front, in such a way that all the hair is inside the towel.

6. Before the administration of the anæsthetic is commenced the neck of the nightgown and jacket worn by the patient should be untied and loosened. The ends of the nightgown should not be turned in, because if pulled from beneath the patient when under the anæsthetic, they may rub the skin on her back. Until the patient is under the influence of the anæsthetic the nurse should remain by her side.

Care of the Patient during her Transit from the Operating Theatre to the Ward.

1. At the termination of the operation the patient should be gently lifted onto the ambulance, and covered with blankets. Her head should be turned to the left side, a towel should be placed under her chin, and a porringer containing a pair of tongue forceps should be placed by the side of her head, to pull out her tongue, in case she vomits or ceases breathing.

2. On the way back to the ward the nurse should push the angle of the lower jaw of the patient forwards, and watch carefully that she is breathing properly.

If the jaw is not pushed forwards the tongue may fall back, when the patient stops breathing and gets blue in the face. In such a case if further manipulation of the chin is not sufficient, the nurse, unless a doctor is near, should take hold of the tongue of the patient with the pair of forceps and pull it forward between the teeth.

Care of the Patient in the Ward.

1. On her return to the ward the patient should be gently lifted with the canvas stretcher and poles onto her bed, which has been specially prepared meanwhile, and covered with blankets. To remove the canvas stretcher the poles should first be withdrawn and the patient then gently rolled from one side to the other.

2. A pillow should then be placed under the knees of the patient.

3. Hot-water bottles, if they are used, and their stoppers must be thoroughly protected with thick flannel covers, and placed *outside* the blanket along the lower extremities of the patient. Some surgeons prefer that the hot bottles should be removed altogether when the patient is returned to her bed and until she has recovered from the anæsthetic, others, if it is available, like an electric cradle to be substituted.

4. The bed-clothes are then arranged over the patient, her head is turned to one side and the pillow put well under her shoulder; a towel is placed under her chin and a porringer on the locker by her side, to be immediately available if she vomits.

The pulse should then be felt and a note made as to its rate and character.

5. She must remain by the bed of the patient until the latter has sufficiently recovered to speak to her.

6. She should keep a watch on the patient afterwards, noting whether her pulse is good, if she is breathing properly, and is of a good colour. Thus the tongue may fall back and partly suffocate the patient when it must be pulled forward.

7. She must inform the sister of the ward if anything untoward occurs, or if the operation is in a private house, she must send for the doctor.

8. If, after an operation, blood comes through the dressings the nurse should act according to the amount of loss she judges to have taken, or to be taking, place. Thus if the amount is reasonably slight and there is only a staining more sterilized wool should be applied under another bandage. It is quite wrong in such circumstances, although not unusual, for the nurse to take off all the dressings and re-apply fresh ones, much to the annoyance of the surgeon.

On the contrary, if the hæmorrhage is severe, pending the arrival of medical assistance, the nurse should remove the dressing soaked in blood and firmly apply fresh dressing.

The additional precautions after a spinal anæsthetic are detailed on page 314.

CAUTION.

During the early stages of being anæsthetized the patient may sometimes struggle and, if addicted to alcohol, be somewhat violent. Nurses usually apply far too much force in their endeavours to restrain such struggles. The force to be applied should be sufficient only to counteract the struggles, that is, the patient should not be forced down and held in that position.

If hot-water bottles are left in the bed, even outside the blankets, a restless patient may easily disturb them and burn herself. A certain amount of intelligence is required when using hot-water bottles. Thus if the character and rate of the pulse are good, and the patient is perspiring, or if the day is very hot, their use is superfluous, if not injurious.

If the operation is an abdominal one and there is retching or vomiting, the nurse must support the abdomen with a hand on each side of the incision to prevent undue straining of the sutures, and this will also lessen the pain. When the vomiting has ceased, the nurse should cleanse the mouth with small wool dabs wrung out of a solution of glycothymoline and held in forceps.

The nurse should regard as sacred any remarks the patient may have made while under the influence of the anæsthetic, and should never repeat what she has heard either to the patient or to anyone else. It has happened, on occasions, that such remarks have been repeated by the nurse to others and, later, reaching the ears of the patient, have caused her great distress.

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CHAPTER XXVIII.

ASEPTIC TECHNIQUE FOR OPERATIONS IN A PRIVATE ·HOUSE.

THE facility and safety with which operations can be carried out in private houses depends partly upon the means and surroundings of the patient and the training and intelligence of the nurse. In some cases, when efficient nursing assistance can be obtained, and the various articles of furniture necessary for an operation can be hired, and a complete sterilized outfit can be purchased, an operation can be conducted with comfort to the gynæcologist and, so far as the aseptic technique is concerned, with safety to the patient. On the other hand, an operation may have to be performed amidst surroundings which are very primitive, and the nurse, so far as her duties are concerned, will have to do the best she can. An intelligent and well-trained nurse will usually be able to make satisfactory arrangements with the means at her disposal. It is only the unintelligent, badly trained and stupid nurse who will create difficulties and fuss everyone about the place.

When an operation is to be performed in a private house the following subjects must be attended to by the nurse :—

Preparation of the room.
Preparation of the instruments, sutures, ligatures, and swabs.
Preparation of the nurses and their duties at the operation.
Preparation of the dressings.
Immediate care of the patient after the operation.

Preparation of the Room.

Room.—If possible a room should be chosen which has a north light, is well ventilated, and is not near the water-closet. If the window of the room is overlooked it should

be covered with thin muslin or smeared with sopacious or a thin solution of whitewash. On the day preceding the operation, the nurse will satisfy herself that the walls, if painted, and all the woodwork in the room are thoroughly dusted; care being taken with the tops of the doors, windows and light fittings. The carpet, curtains, and upholstery on the bed should be removed, together with the pictures and all the furniture which will not be required. The floor should then be thoroughly scrubbed. The furniture and woodwork should again be dusted with a damp duster on the morning of the operation.

If, however, the operation is one of emergency, and there is not sufficient time to allow of all these preparations being made, then dust should not be disturbed by dusting. The furniture which will not be used should be removed as gently as possible, a sheet wrung out in lysol, **1 drachm** to the **pint**, should be tacked down over the carpet, beneath the operating table, and any furniture not removed and not being used for the operation should be covered with clean sheets. The temperature of the room should be in the region of 70° F. If there is a fire (coal, gas, electric) in the room the anæsthetist's table, if supporting a bottle of ether, must not be placed near it since the ether escaping may float towards the fire and backfiring explode the ether bottle. Such an explosion happened, in the experience of the author, at a nursing home, when the window curtains caught fire, and the operation had to be delayed while they were pulled down and trampled upon.

Furniture.—The following articles must be procured and arranged in convenient situations :—

Operating table.	Instrument table.
Table for dressings.	Swab table.
Washstand.	Sterilizer.
2 Basins for hand lotion.	Anæsthetist's table and stool.

1. As a rule the doctor will bring his own operating table. If not, a table for this purpose must be procured, if possible, about 4 feet long, 2 feet broad, and 28 inches high. An ordinary kitchen table will be found to meet these requirements.

2. Six small square tables, one for the dry sterilized swabs or dabs, or if these are being rinsed then this table will be used to hold the two basins containing the water; one for the instruments; two for basins containing the lotion for
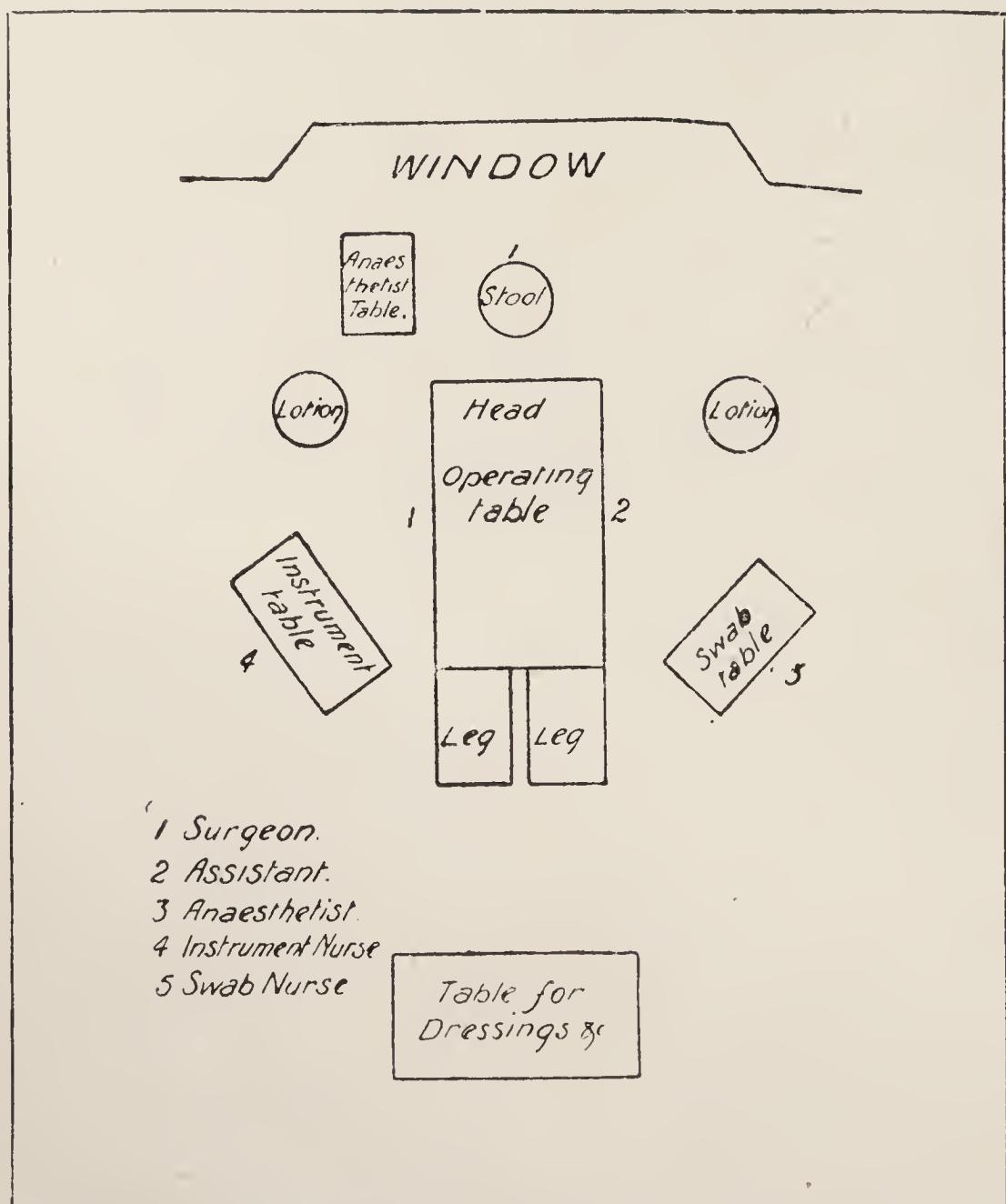
FIG. 62.—ARRANGEMENT OF TABLES FOR MAJOR OPERATIONS.

the hands; one for the anæsthetist's apparatus, and one for the dressings. Tea tables, work tables, washstands, or dressing tables will do, and if these are not available, very good substitutes can be made with ironing boards, or leaves from

an extension table resting on chairs. Chairs or packing cases will do for the hand lotion. These tables should be thoroughly dusted with a damp cloth, and then covered with
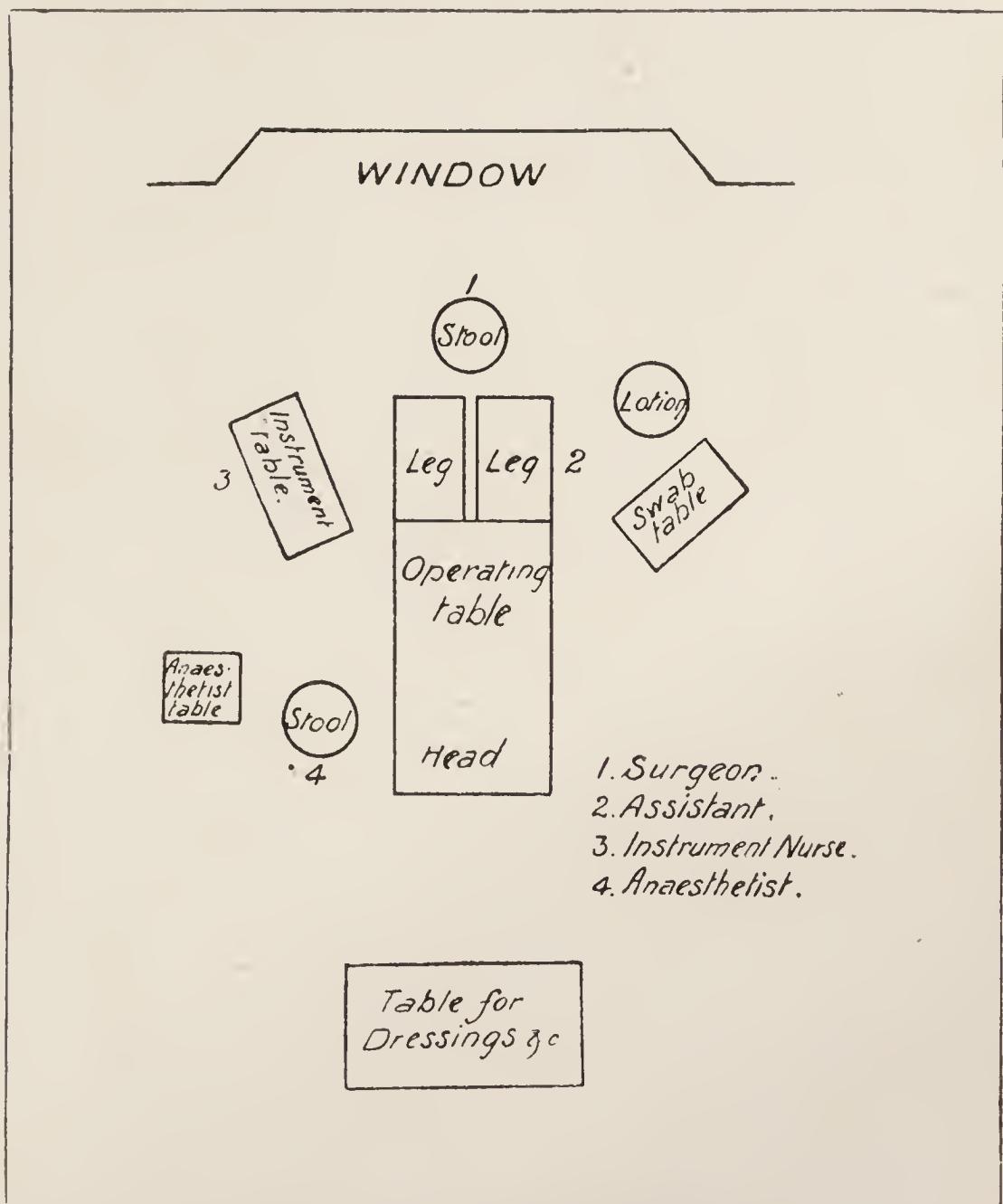
FIG. 63.—ARRANGEMENT OF TABLES FOR MINOR OPERATIONS.

clean sheets or towels, and, if their tops are polished, with thick layers of paper first.

3. Two chairs with wooden or cane seats, one for the anæsthetist and one for the operator if he needs it.

4. A washstand to hold the basins for washing the hands.

5. A nail-brush sterilized by boiling, or by immersion in a solution of biniodide of mercury, 1 in 2000.

6. A cake of soap.

7. Two clean blankets, one sheet, and one piece of macintosh sheeting for the operating table.

8. If the doctor does not bring sterilized towels with him, clean towels, not new, must be procured. The towels should be sterilized by boiling. At least 8 may be required.

9. Two dishes, one for the instruments, measuring, if possible, 12 inches, and a smaller dish 6 inches, for the ligatures and sutures. Meat dishes will do very well. Many surgeons prefer their instruments to be arranged on sterilized towels, in which case these dishes will not be required.

10. Six basins, 2 in which to wash the hands, 2 to contain the lotion (biniodide of mercury 1 in 2000) for the hands, and 2 for the swabs if dry sterilized swabs are not used.

These dishes and basins should be cleaned before use, sterilized by burning in them a little methylated spirit, after which they should be turned upside down and covered with towels until they are required.

11. It will be necessary to have a sterilizer of some description, even if the instruments have been already sterilized, because an instrument may be dropped during the operation and have to be re-sterilized. In the absence of a proper instrument-sterilizer, the nurse should procure a fish-kettle, or saucepan large enough to take the instruments, which has been properly scoured, cleaned, and lined with a towel.

12. One gallon of cold water, which has been boiled.

13. One gallon of boiling water. The mouths of the jugs containing the water should have gauze tied over them.

14. A clean foot-bath or pail for receiving any soiled water or discharges.

15. A piece of oilcloth or linoleum to place under the table when vaginal or vulval operations are to be performed, so that the floor of the operating room and the ceiling of the room below can be protected. If oilcloth cannot be procured, brown paper or newspapers must be substituted.

16. The bedstead should be thoroughly cleaned, the mattress aired, and the bed made up with clean sheets, a piece

of macintosh sheeting over the lower sheet, and a clean draw-sheet over this.

17. Two hot-water bottles carefully covered with flannel so that they will not burn the patient should be provided in case they are wanted. Especial care should be taken that the metal stopper is not in any way exposed. *Unless properly looked after, hot-water bottles are a source of the greatest danger to the patient who, when unconscious after the operation, is unable to feel them burning, with a result that very serious ulcers are caused, which may take 2 months or longer to heal. Patients who are thus burnt may sue the doctor, nurse or nursing home, and heavy damages have been obtained in such cases.*

18. After an abdominal section, or vaginal hysterectomy, a cradle will be wanted. If a proper cradle cannot be procured a very good substitute may be made by buying some wooden hoops, of a suitable size, as used by children, cutting them in half, and then joining the pieces together by three lengths of wood and screws. Such a cradle can be made in quite a short time by some male member of the household.

19. A douche-can, brandy, nutrient enema-syringe for giving brandy enemata, and the solution for giving saline injections, if the operation is of a serious nature, should be available.

It is better that the patient should occupy another room until the time arrives for her operation, but if this cannot be managed, screens should be set up round her bed to prevent her being alarmed by the preparations for the operation. If the operation has to be performed at night some sort of adjustable artificial light must be procured. An electric standard with a high candle-power lamp is the best. Gas decomposes chloroform, the result being very irritating to the throats of those present. In an emergency an acetylene bicycle lamp properly arranged will give a splendid light, and an electric torch may be found useful.

20. The diagrams, Figs. 62 and 63, indicate the position of the surgeon, his assistant, the instrument sister, and other tables used by the author. Many surgeons will require 1, 2, 4 and 5 to be on the opposite side of the table.

Preparation of Instruments, Ligatures, Sutures, and Swabs.

A nurse who intends to take up surgical work in private should master the duties set out for a theatre sister on page 247. She should know the names of the principal instruments during the operation, in case she is given charge of them. The surgeon will bring his own instruments.

All details as regards ligatures, sutures, swabs, gown, gloves and mask will be found on pages 238, 244. Otherwise she will have to do the best she can, and an intelligent nurse will probably be able to satisfy the most exacting surgeon.

IMMEDIATE CARE OF THE PATIENT AFTER THE OPERATION.

This is dealt with on page 295.

The nurse should enquire of the doctor before he leaves the house of the patient who, if anyone beside herself, is to be allowed to see the patient before his next visit, and she must not leave the patient without securing someone temporarily to take charge.

CHAPTER XXIX.

PREPARATION OF THE NURSE. PLACING THE PATIENT IN POSITION. ASSISTANCE DURING AND DUTIES AFTER THE OPERATION IN A PRIVATE HOUSE.

THE preparation of the nurse, and the assistance she will and may be required to give during the operation, will be a combination of those to be found fully described under the rules set out on pages 247 to 262 for the theatre and ward sisters and theatre nurse.

It is obvious that if she be the only nurse available she must do the best she can in the circumstances.

If possible, and especially if the operation is of a serious nature, two nurses should be available at the time of, and for a week following, the operation. In this case during the operation one nurse should act as theatre sister and the other as ward sister and theatre nurse combined.

In the rules referred to, it will be seen that the nurses have to wear sterilized overalls and veils. Nowadays the surgeon generally sends or brings a tin containing the sterilized clothing for the nurses and doctors, and coverings and towels for the patient. Such tins, containing, already sterilized, the necessary articles of clothing for the surgeon and nurses, the coverings, swabs, dabs, and dressings for the patient, can generally be obtained in most towns of any importance.

If such a tin is not available the nurse must sterilize a number of towels by boiling them, and in place of an overall she must pin a large towel round her neck, so arranging the towel that it covers the front of her body.

Sterilized Articles that the Tin should contain for a Major Operation.

A body-cover.	10 Small swabs.
6 Towels.	2 Yards of gauze.
3 Gowns.	Half-pound of absorbent wool.
3 Masks.	A many-tailed binder.
2 Large swabs.	A packet of safety pins.

Sterilized Articles that the Tin should contain for a Vaginal Hysterectomy or Minor Gynæcological Operation.

A pair of leggings.	3 Dozen dabs.
A perineal-cover.	2 Yards of gauze.
4 Towels.	Half-pound of absorbent wool.
3 Gowns.	A T-bandage.
3 Masks.	

Figs. 41 and 42 show a sterilized tin containing these articles, as put up for the author by Messrs. Bell & Croyden. Different surgeons will vary the contents of these tins, according to their predilections, so that if the nurse is directed to procure such a tin, she must ask the surgeon whether he has a special tin of his own, if not, what articles he wishes the tin to contain. The towels are used for covering the instrument and swab tables, and any part of the surroundings of the patient thought necessary and not protected by the body or perineal covers, and for the hands of the surgeon and nurses.

India-rubber gloves should be worn at all operations, and by all concerned in the immediate performance of the operation except the anæsthetist. By their use the risk of infecting the patient is very much diminished since they can be sterilized, whereas the hands cannot. In addition, gloves protect the hands of the nurse from contamination with any pus that may be present, and so lessen the chance of her conveying infection to some other patient.

Placing the Patient in Position.

It is most important that a nurse who is helping at a surgical operation in private should be thoroughly conversant with the proper method of placing the patient in position for an abdominal or vaginal operation. The nurse is referred to pages 207 to 208 for a description thereof. In addition she should particularly remember :—

That every operating table has not got a foot-piece which will let down and to which the legs can be fastened before the patient is tilted in the Trendelenburg position. If it has not the legs of the patient cannot be fixed at right angles to her body, until she is tilted. While, therefore, the patient is being tilted the nurse must take hold of the ankles of the patient and, pushing them back, thus keep the legs at right angles to the body, otherwise the patient will slide down the table and her position will have to be readjusted. It is after the patient is in the required position that the ankles are tied to some part of the table.

Again, if a Clover's crutch is being used the nurse should remember that the rings of the cross-bar should be adjusted below the knees of the patient and not above. Also that the strap is passed over one shoulder, round the neck and under the opposite axilla.

The training of a nurse should always include the method of placing a patient in any of the recognized positions for operations. That in the past, at anyrate, this has not always been included is evident from the pathetic scenes witnessed from time to time, when owing to the stupidity or ignorance of the nurse the patient proceeds to slip into the lap of the anæsthetist when being placed in the Trendelenbnrg position. Again, if the Clover's crutch is applied with the rings above the knees, the buckles are in such a position that the straps cannot be attached, and if the strap is entirely round the neck it nearly dislocates it. There is no use in telling a nurse in training *how* to fix the patient. The sister responsible for the training of probationers should have a live model on which the nurses can practise, one of themselves will do quite well. Those who are responsible for the training of nurses should attend to such practical details as have been discussed. Nurses

could very well do with more practical training and less theoretical, especially when the latter has no immediate connexion with their duties.

In many of the hospitals concerned with the training of nurses, there are now rooms set apart furnished with the articles used in an operating theatre. In this room the probationers are taught their duties so that when their term of duty in the operating theatre arrives such scenes as might shock the least sensitive of surgeons and visitors are eliminated.

If the operation is vaginal or vulval in nature the nurse must improvize a contrivance to conduct blood from the site of the operation, and any lotion that is used, into the pail, as follows. A macintosh, covered with a sterilized towel, is placed under the buttocks of the patient. The macintosh and towel should be rolled several times at the end upon which the patient will rest, and be so arranged that it will form a ridge and prevent fluids escaping under the back of the patient. The sides should then be folded in, to form a gutter, and the free ends should be inserted into the pail.

The patient should also have on a thick pair of stockings so that the rings of the Clover's crutch do not injure her by their pressure. In addition a piece of wool should be inserted between the strap and the leg in the neighbourhood of the buckle of the ring, to prevent the strap hurting the skin of the patient.

When a patient is fixed in the lithotomy position with a Clover's crutch, her body will be very unstable. It is, therefore, most important that the nurse should hold the patient in position by means of the crutch. If the nurse has to leave the patient she must ask the anæsthetist to hold the crutch meanwhile.

Preparation of the Dressings.

A list of the dressings which may be required for the different gynæcological operations will be found on pages 320 to 323. The nurse must ascertain from the doctor what dressings he will require.

Duties after the Operation.

Tidying the Room after Operation.—As soon as possible after the operation, the soiled linen, operating table and instruments should be removed and the room rearranged, two tables being left, one for the dressings and one for the use of the nurse. If there is only one nurse she must ask some member of the household to undertake this duty.

An armchair and a camp-bed or sofa, if there is only one nurse and it is necessary for her to remain in the room during the night, should also be supplied. A lamp, candle, or electric light, properly shaded, so that the nurse can read, and write her report, without disturbing the patient, will be required. The blinds must be drawn and the room kept quiet, so that the patient may sleep, if possible, when she comes out of the anæsthetic.

CHAPTER XXX.

ANÆSTHETICS.

When operating in private the anæsthetist will bring with him most of the articles he will require. The nurse, therefore, will have to supply only a table covered with a clean towel and a chair, or stool, for the anæsthetist to sit upon.

In hospital practice the nurse whose duty it is must place all the articles which the anæsthetist will require, or may require, on the table provided for this purpose. She must ascertain his wishes. They usually are as follows :—

A, B, C. Bottles of ether and chloroform. In some hospitals, in which the anæsthetist uses A.C.E., alcohol as well.

D, E, F. An ethyl chloride spray ; a medicine bottle, fitted with a Hewitt's dropper, and a chloroform bottle.

G, H. Bellamy Gardner's wire mask for open ether. A chloroform mask.

J. A roll of gauze and a square of gamgee, 8 inches. Lint.

K, L. Clover's inhaler with a re-breathing bag, and face pieces, numbers 4, 5, 6.

M, N. Tongue forceps. Mason's jaw gag. O. Hewitt's airways.

P. Ether measure and funnel.

Q, R. Kidney dish, towel, swabs in bowl, and empty bowl.

S, T, U, V. Hypodermic syringe and needle, adrenalin (1 in 1000), strychnine, amyl nitrite.

Cylinders of oxygen and CO_2 and gas bag may be required.

In the modern anæsthetic stand many of the articles mentioned are fixtures.

The gauze is to insert into the ether mask. The gamgee tissue is for those anæsthetists who put this over the face before applying the ether mask. So that the face of the patient shall not get burnt, vaseline is smeared on it. Should a drop of ether or chloroform accidentally contaminate the eye castor oil is instilled into it.

Adrenalin, 3 minims of 1 in 1000, is injected into the heart if this organ fails. The strychnine and amyl nitrite are for cardiac

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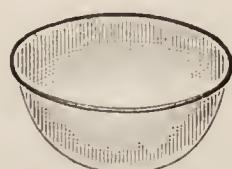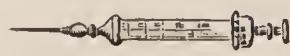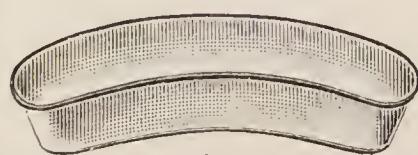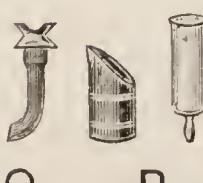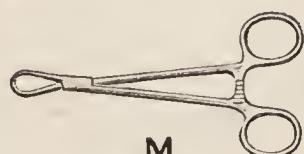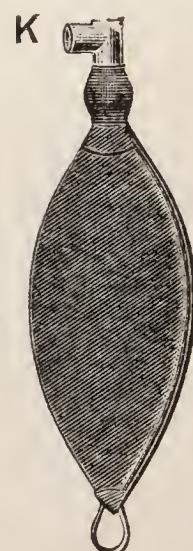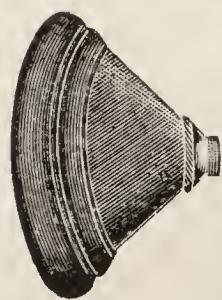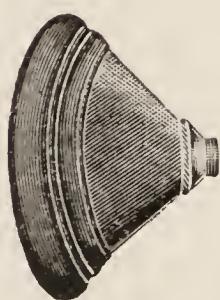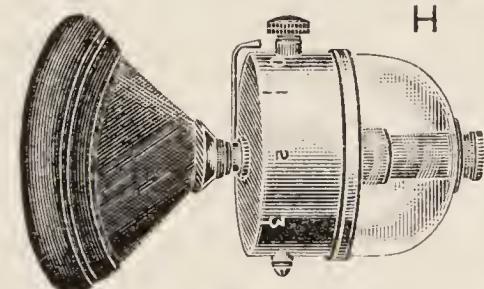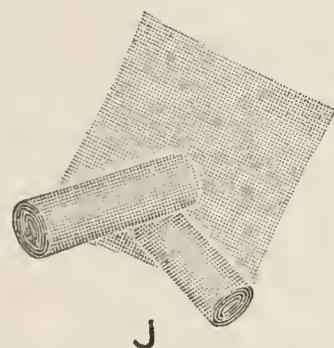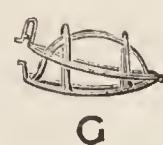
FIG. 64.

or respiratory failure. The oxygen is for use if the breathing becomes a little embarrassed, or when the anæsthetist wishes to use gas and oxygen. Many anæsthetists are now accustomed to give a dose of CO_2 if the breathing becomes very shallow and at the termination of an operation. This lessens the liability to post-anæsthetic sickness.

An increasing number of anæsthetists are accustomed to give the patient a *basal anæsthetic*, before the administration of ether or gas and oxygen for the operation. The advantage claimed for the basal anæsthetic is that the patient is sent to sleep before she is taken to the operating theatre, and does not wake up till she is in bed again after the anæsthetic. Basal anæsthetics can be administered orally, intravenously, or by the rectum. The most common drug used for this purpose is nembutal.

Oral Basal Anæsthetic.

Nembutal.—

The dose is 3 grains given by the mouth. The patient is placed on an ambulance, so that she shall not wake up when moved. She goes to sleep in a few minutes. The dose is given 45 minutes before the operation.

Dangers. This drug at times affects the kidneys. The urine should therefore be tested for 2 or 3 days after nembutal has been administered, in case it discloses signs of renal disturbance.

Patients are nearly always very restless after they have been given nembutal, at times so restless that they have to be held down.

Rectal Basal Anæsthetic.

Avertin.—

Articles for the Administration of Avertin.

1. Glass funnel and catheter.
2. One or two pints of warm water for bowel lavage.
3. Solution of avertin ready prepared, and of correct temperature.

This drug is given *per rectum*. The dose is 0·1 gram for every 2 pounds 3 ounces weight of the patient, so the patient

has to be weighed before the solution of avertin in saline is made up. The quantity to be injected therefore varies according to the weight of the patient.

1. A rectal wash out is first given.

2. The patient is then placed on an ambulance, otherwise when moved from the bed she may wake up or expel the injection.

3. The solution is injected through a catheter and glass funnel and this should take, on the average, about 15 minutes.

4. After the use of avertin patients are at times extremely restless during their return to consciousness.

Intravenous Basal Anæsthesia.

There is a group of chemical compounds known as *barbiturates*, many of which are used for inducing anæsthesia by intravenous injection. Hexobarbitone (Pentothal), one of this group, has been most widely used for some years for inducing anæsthesia by intravenous injection. Hexobarbitone is variously known, depending on the chemist who manufactures it—such as cyclonal sodium, hexanastal and evipan (a German preparation). Pentothal is sometimes used as the sole anæsthetic throughout the operation.

Pentothal dissolves freely in water, but the solution is stable only for an hour or two. Its action is rapid in onset, and of short duration. The drug is supplied in the form of a powder, and the solution, in distilled water, is run into a vein at the rate of 1 c.c. in 15 seconds, the dosage being determined by the results obtained. The average amount to induce unconsciousness is 3 c.c., and the patient is unconscious in about a minute and remains so for 10 to 20 minutes.

Spinal Anæsthesia.—

The following articles should be assembled on a table :—

1. Ampoules of stovaine 5 per cent., mixed with glucose, 2 per cent.

2. A 2 c.c. syringe and spinal needle properly sterilized.

3. A pair of sterilized gloves.

4. A bowl of swabs, and an empty bowl for dirty swabs.

5. Collodion and towels.

6. A hypodermic syringe, needle properly sterilized, and a solution of novocaine, 1 to 2 per cent. This is to inject into the skin in nervous or very sensitive patients, prior to inserting the spinal needle.

Nurse's Duties.—

1. She must place the patient on her side with her thighs completely flexed or, according to the wishes of the anæsthetist, sitting up with her body bent as far forward as it will go. The reasons for these positions is to get the spine arched as much as possible, so that the anæsthetist should have no difficulty in inserting the spinal needle.

2. Since the anæsthetist will decide at what point he intends to insert the spinal needle, the nurse must pull up the patient's nightgown, so that the iodine or surgical spirit can be applied, and which is handed to him with the swabs.

3. When the anæsthetist has inserted the needle he will withdraw the stylet, when a few drops of spinal fluid are allowed to escape. The nurse will then hand him the syringe which has been previously sterilized and filled with the solution of stovaine in the ampoule.

4. The nurse will then keep the patient's thighs flexed for so long as the anæsthetist tells her, generally for 5 minutes. This is done so that the stovaine may act on the spinal cord in the lumbar region and not trickle up the spinal cord to a higher region.

After the operation the nurse will keep the legs of the patient flexed and the head lower than the buttocks. This obviates headache, and there should be a special wooden apparatus on the trolley to keep the patient in this position, and when moving the patient from the trolley to her bed, her head must be kept lower than her buttocks, and the end of the bed must be tilted on 2 chairs or wooden blocks.

Dangers. Extreme care to be taken in slowly moving the patient ; jerky movements cause headache. Watch the eyes of the patient very carefully for 2 or 3 days.

Duties of a Nurse when the Patient has been returned to her Bed.—

These duties have already been dealt with.

CHAPTER XXXI.

AFTER TREATMENT IN MINOR AND MAJOR OPERATIONS.

THE nurse must ascertain from the gynæcologist exactly how he wishes his patient treated after the operation, as individual surgeons have their own particular methods. The methods suggested in this chapter are the outcome of an experience of many thousands of cases, and may be followed unless the nurse has directions to the contrary.

A daily record should be kept for every patient, containing such details as the pulse-rate, respiration-rate, temperature, the times the bowels have acted, the amount of sleep the patient has had, the quantity of nourishment she has taken, and the quantity of urine she has passed in the 24 hours.

Pulse.—The pulse-rate should be taken every 4 hours and charted. The pulse is by far the most important means of estimating how the patient is progressing after an operation, and all nurses would be wise to practise taking it in such cases on every suitable opportunity.

The pulse-rate is quickest for the first 12 hours after the operation, but during this time should not much exceed 100 a minute. After this, if everything is progressing satisfactorily, the rate should fall. If the pulse-rate does not fall but continues to rise, this is, as a rule, a bad sign. If the patient is suffering from shock or hæmorrhage the pulse-rate may be increased to 140 or more, becoming at times uncountable, while, in addition, with hæmorrhage the pulse is very soft and weak. Distension of the abdomen, if marked, will increase the frequency of the pulse-rate. In peritonitis the pulse is hard and wiry and its rate rapidly increases to above 120, the pulse gradually becoming running in character, and at the end cannot be counted.

The Room.—The room must be well ventilated and kept at a temperature of 65° F. To accomplish this there should, if necessary, be a fire in the room and the window should be a little open. Great care must be taken that the patient

is not in a draught, and this may be obviated, if necessary, by a judicious arrangement of screens.

The best way to admit air through the window is to place a piece of wood 4 inches high and the breadth of the window under the bottom sash, by which means the air will pass into the room up to the ceiling between the two halves of the window.

Relatives should not be admitted unless the doctor gives permission, and following the operation the nurse must for some hours remain with the patient, so that if the nurse requires help she must summon it by bell.

Cleaning the Instruments.—See page 238.

Cleaning the Gloves.—The gloves are scrubbed with soap and water, inside and out, then rinsed in clean water, boiled for 10 minutes, and then dried with a towel and powdered with boric acid.

Temperature.—The temperature should be taken under the patient's tongue every 4 hours and charted. The temperature must never be taken just after the patient has had a hot drink, since this may result in the temperature being raised a degree. As a rule within 8 hours after the operation the temperature rises to nearly 100° F., it then gradually falls to normal. If the patient is very neurotic the temperature may keep above normal for a few hours.

A subnormal temperature points to shock or bleeding.

A rapidly rising temperature, especially on the 2nd or 3rd day, is of serious import, pointing as it may do to peritonitis being the cause, although, if the disease is so rapidly fatal as to cause death in the first 2 or 3 days, in many cases the temperature may remain subnormal.

A persistent high temperature without any apparent cause after the operation may be found on examination to be due to a stitch abscess, hæmatoma of the wound, pelvic hæmatocele or pyelitis. In many instances a slightly raised temperature will become normal after the bowels have been opened.

Respiration.—A rapid respiration-rate soon after an abdominal section may be due to shock or hæmorrhage, and later an increase in its rate may be due to massive collapse of the lung, bronchitis, pneumonia, peritonitis, or a pulmonary embolism.

The remarks under pulse, temperature, and respiration refer more particularly to patients after major operations. After minor operations the pulse, temperature, and respiration are, as a rule, normal.

Sleep.—It is important for the patient to have a proper amount of sleep after an operation, and especially if it be an abdominal one. For the first few days sleeplessness is often troublesome. The patient may be unable to sleep because of an uncomfortable position, because of noise, because of nervousness and worry, because of abdominal distension or pain.

The treatment of pain and abdominal distension is given under their respective headings. For the rest the patient should be left as quiet as possible, the room should be darkened, visitors should not be allowed, except those of the nearest relatives and then only for a very short time. The chattering of nurses in the corridors and kitchens of some Nursing Homes is, at times, positively shocking. Also the noise due to the shattering of china articles and the rattling of furniture on the floor of the kitchen, the banging of doors and of the gates of a lift. Matrons should pay more attention to this curse, and once a nurse has been a patient in a Nursing Home she may, perhaps, realize the justification of these remarks. A capable nurse will be able to encourage her patient to sleep by arranging the pillows suitably. Warmth and fresh air will help considerably to induce sleep, and if the patient is of a worrying disposition, the doctor will order a sleeping draught, such as allonal, bromide, dial, medinal or sulphonal.

Thirst.—This is a very distressing symptom, and the following methods may be tried for its relief. The mouth may be swabbed out with hot water or glycerine and borax. The patient may be allowed to wash her mouth out with hot or cold water into which a little lemon juice has been squeezed, or soda-water. Saline injections into the rectum, 6 ounces every 4 hours, will relieve the thirst to a great degree. Hot or cold tea, with or without milk, will often relieve thirst, as also will vinegar and water, $\mathfrak{z}$ i to $\mathfrak{z}$ vi, which encourages the flow of saliva. The practice followed by the author of allowing his patients, after operation, to drink, in small quantities, as much water as they desire, has been found to abolish in most

cases the troublesome symptom of thirst. Some patients find relief from sucking acid drops, which encourages a flow of saliva.

Sucking ice is not a good remedy; in most cases the relief is only momentary, the thirst increases, and flatulence results.

Tongue.—For the first 24 hours following an abdominal section the tongue is generally dry and rather brown. After this it should be moist and rather white. In peritonitis and intestinal obstruction it becomes dry, brown, or red, glazed or ulcerated.

Bladder.—*Perineorrhaphy.*—After this operation patients rarely pass urine within 12 hours. If an extensive anterior-colporrhaphy has been performed the catheter is passed, if the patient has not already micturated naturally within 12 hours and thereafter every 12 hours. This must be done with great care.

Other Minor Operations.—There is usually no need for the catheter to be used.

Abdominal Section and Vaginal Hysterectomy.—After an abdominal operation patients rarely pass urine within 12 hours. Some surgeons prefer the passage of the catheter to be delayed for 18 hours, unless the patient is in great pain from distension of the bladder, when the catheter should be passed at once. A capable nurse, however, can usually induce the patient to micturate before the 18 hours. Patients catheterized too soon after operation easily acquire the catheter habit and, at times, appear unable to pass urine naturally many days after catheterization has become quite unnecessary. Unless there is retention, the catheter is not used again, except in the case of vaginal hysterectomy when clamp-forceps have been left on, and then the catheter, which must be used with the greatest care for fear of disturbing the forceps, is passed every 12 hours until they are removed.

The catheter should be used only when absolutely necessary and then at regular intervals. Frequent passage of the catheter not only increases the risk of infecting the bladder, but also makes the urethra sore, and subsequent micturition painful.

It is very important after major operations to measure the amount of urine passed, and in every case to note any abnormal

constituents in it, such as blood and pus. The amount first passed after a major operation should be 4 to 5 ounces; a less amount than this implies shock, hæmorrhage, suppression of urine, or injury to the ureter, and in the latter case, or in injury of the bladder, it may be mixed with blood. If, after an abdominal section, the patient is passing her urine naturally, and the amount is less than might be expected, the catheter should be passed at the end of micturition to make sure that there is no residual urine due to partial retention.

If any of the operations have involved suturing of the bladder, the surgeon will either tie in a catheter or direct the nurse to catheterize the patient for some days.

Bowels.—*Vaginal Operations.*—If the operation is of a non-plastic nature an aperient is given on the second night after the operation and an enema the following morning. The best aperient, probably, is the one the patient is used to taking.

The method of treating the bowels, if the operation is of a plastic nature, varies according to the doctor's directions. The author keeps the bowels of the patient confined for 3 days and then orders cascara or senna on the 4th evening after the operation, the patient for the previous 2 days having taken a dessert-spoonful of liquid paraffin. Violent purgatives, such as castor oil, should not be administered, since the resulting diarrhœa tends to digest the catgut sutures.

Abdominal Section and Vaginal Hysterectomy.—On the fourth evening after operation an aperient is given. An aperient is then administered once daily if necessary.

RECTAL TUBE.—After vaginal hysterectomy and any abdominal section it may be necessary to pass the rectal tube, and perhaps to give a turpentine enema or wash out. The indication is when the intestines become distended with flatus and the pain resulting therefrom is troublesome. Since such distension does not, as a rule, occur before 24 hours after the operation, any flatulence prior to this is of gastric origin, and the use of a rectal tube is contra-indicated. When a patient is disturbed by intestinal flatus, the passage of a rectal tube once or twice will probably suffice. In some cases it may be necessary to pass it every 4 hours for a day or two. If the aperient is given two nights before the

major operation, and thereafter the bowels are not inter-
fered with, by enema or otherwise, it is very rarely necessary
to use the rectal tube.

The rectal tube has to be passed very carefully, the end
being first smeared with vaseline to prevent it kinking when
inserted into the bowel, and should this happen it must be
taken out and passed again. An X-ray examination shows
that the tube can rarely be passed into the pelvic colon,
because the tube usually doubles up when it reaches the
upper part of the rectum, and attempts to force it further only
produces a greater amount of curling. The tube must be
pushed up, using ordinary care ; with the tip vaselined it
will go further in some patients than in others, but an average
distance is about 6 inches, the total length of the tube being
31 inches. There are various patterns of rectal tube ; the
best is one with the hole at the end and not, like a catheter,
at the side.

As a rule, very little discomfort is caused by passing the
rectal tube, and when its use is indicated the relief to the
patient is often very marked. Occasionally, however, if the
patient has hæmorrhoids, great distress is caused by the passage
of the rectal tube, and in these cases it is best to introduce a
little gall and opium ointment some time before passing it.

Having introduced the tube as far as possible, it is kept
in position so long as any flatus is escaping. If flatus is not
passed the tube is left *in situ* for about 5 minutes, its free end
being kept under Condy or mercury solution in a porringer.

Dressing.—*Vulvo-Vaginal Operations.*—The successful
termination of these operations probably depends more upon
the nurse than anyone else, the reason for this being the great
difficulty which is experienced in keeping the wound aseptic.
Practically all the failures of this operation can be traced to
the wound becoming septic and breaking down superficially,
since it is so easily contaminated with urine, fæcal discharge,
leucorrhœa or the menstrual discharge, unless kept as clean as
possible. In the majority of cases when this happens a good
result is still obtained, the wound healing by granulation, but
the convalescence is prolonged and the discomfort to the patient
increased. In a few cases the wound sloughs, so that, after all
the worry, pain and perhaps expense have been incurred, the
operation is a failure, and will have to be repeated.

Most surgeons, unless there is an offensive discharge, do not order douching in these cases. The wound area is irrigated, whenever it is soiled, with normal saline, flavine or permanganate of potash solutions. There are various methods used for dressing the wound, which is done twice daily. The wet method is by irrigation with one of the solutions mentioned. The dry method is by swabbing the wound gently with swabs wrung out in perchloride of mercury after which it is sprinkled with a sterilized powder composed of starch, boric acid, and talcum. The wound is best irrigated by pouring the solution out of a jug.

If silk-worm gut sutures have been used they are removed on the 12th day.

Removal of Cysts and Tumours from the Vulva.—The dressing is practically the same as above.

Trachelorrhaphy.—*Removal of Vaginal Cysts or Tumours.*—*Amputation of Cervix.*—If after these operations a piece of gauze is left in the vagina, it should be removed the next morning. The stitches are taken out on the 12th day, unless catgut sutures have been used.

Curetting.—Many surgeons do not employ dressings after a curetting other than those of a pad and T-bandage. If tampons are inserted into the vagina, or the uterus has been packed with gauze because of rather free bleeding, these are removed according to the directions given by the doctor, generally on the following morning. If the nurse is directed to remove the gauze she must do so very gently, as otherwise a piece may break off and be retained in the uterus.

Caution.

Although the nurse, if present at the operation, should note that packing, or a swab, has been left in the vagina, it is the duty of the surgeon to call her attention to the fact. The nurse will then have no excuse to offer if she neglects to remove the packing or swab the next morning. Such forgetfulness has not infrequently occurred, with the result that the surgeon is very puzzled because the patient has a most offensive discharge, and perhaps a rise of temperature. In such circumstances it is only when the surgeon orders a douche to be given that the presence of the packing, or swab, is detected.

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Vaginal Hysterectomy.—If, during a vaginal hysterectomy, gauze has been inserted into the pouch of Douglas it is left there for 36 hours. After its removal the surgeon may order the nurse to cleanse carefully the lower part of the vagina every 4 hours with a swab of absorbent wool soaked in some antiseptic and held in a pair of ring forceps.

Caution.

Supposing clamp forceps have been left on, the nurse must be very careful that the patient does not interfere with them, especially when recovering from the anæsthetic, and she must also be very careful when catheterizing, or otherwise attending to, the patient for fear of detaching them.

Abdominal Hysterectomy.—As a rule the dressing, if used, need not be renewed until the 5th day, when the stitches or clips are taken out. A fresh supply of dry dressing must then be ready. If the surgeon wishes to strap the wound after the stitches or clips have been removed, some long strips of adherent plaster, about 2 inches broad and 12 inches long, must be available.

If a rubber tube has been inserted into the abdominal cavity and much blood is coming through, the dressings must be changed, and the doctor summoned, as they must be if the tube was inserted for pus. The tube is removed the day after the operation if inserted to evacuate any blood that may have oozed, but if it has been inserted because of the presence of pus in the operation-site, then the time for its removal will vary according to the nature of the case. As a general rule it will not be disturbed for 5 days, after which it will be removed altogether, shortened, or reduced in size. It is as well to give the tube a turn when dressing the wound ; this will prevent it sticking and so make it easier to withdraw when the time arrives to do so.

The author has not used an abdominal dressing or binder, except when a drainage tube has been inserted, for many years. After the clips have been inserted the nightgown is pulled down and the patient removed to her bed. It might be thought that the wound would become septic but it does not, and the patient having perhaps touched it once is not inclined to do so again. Apart from the great saving of expense to hospitals,

of binders and dressings, patients are far more comfortable without the heat and tension of the binder and the chafing of the retaining straps against the thighs to keep the binder from slipping up. The idea was suggested to the author by one of the sisters of his hospital upon whom he performed a hysterectomy. Having suffered from the binder and dressing after a previous appendicectomy, she asked to be allowed to dispense with these contraptions and asserted that the difference in comfort was remarkable.

If, however, the patient has severe vomiting after the operation, a binder is applied till the vomiting ceases.

Some surgeons having inserted silkworm gut as retaining sutures, leave their ends long after tying them, place a thick roll of gauze along the incision and tie the loose ends of the sutures over it. This method is an additional guard against the formation of a hæmatoma in the wound.

Douching.—The douches generally used are tincture of iodine one drachm to 19 ounces of hot water, biniodide of mercury, 1 in 4000, or dettol, 1 in 40.

Operations on the Vulva.—Apart from the irrigation of the vulva referred to, most surgeons prefer to keep the wound dry and clean by swabbing with some antiseptic, unless the discharge becomes very offensive when douches will be ordered. If the surgeon requires his patient to be douched the nurse must ascertain how often this is to be done and what disinfectant is to be used. As a rule, twice a day is considered sufficient.

Operations on the Vagina, and Cervix, and Curetting.—Unless there is a septic discharge following such operations, douches are not employed since they in their turn may be the cause of infection.

Vaginal Hysterectomy.—About the 10th day, after vaginal hysterectomy, the discharge, in most cases, commences to be offensive. This is due to some sloughing of the injured parts and to separation of the ligatures. It is then customary for the surgeon to order a vaginal douche twice daily. If a douche is ordered it must be given with very gentle pressure, the douche-can being held but very little higher than the patient.

Abdominal Section.—After abdominal section douches are not ordered. In some cases after a total abdominal hysterectomy

an offensive discharge will appear during the second week, due to separation of the ligatures. If so, the surgeon may order a vaginal douche, when the same care should be taken as in the case of vaginal hysterectomy.

Diet.—*Vulvo-Vaginal Operations.*—Six hours after the operation the patient can be given 4 ounces of tea and milk. So soon as vomiting, if present, ceases, the patient is allowed to take as much fluid as she likes, which incidentally helps to prevent retention of urine, and she may have a light diet before the bowels are open. If the operation has been one of complete perineorrhaphy, the patient will be ordered liquid diet until the bowels are open.

Other Minor Operations.—Eight hours after the operation the patient is given 4 ounces of tea and milk or hot milk and water. The patient then returns to a normal diet.

Major Operations.—See next chapter.

Toilette of the Patient.

Mouth.—Great care must be taken by the nurse to keep the mouth of the patient clean. This is best accomplished for the first 3 or 4 days after the operation by means of small wool swabs held in ring forceps and soaked in a solution of bicarbonate of soda, and this should be done several times a day. In addition the patient should wash her mouth out with glycothymoline or peroxide of hydrogen, and as soon as possible she should resume the cleaning of her teeth with a toothbrush. Until vomiting has ceased dentures must not be replaced and, otherwise, not till the morning after the operation.

Hands and Face.—These should be washed with warm water and soap at 7 a.m., 2 p.m., and 7 p.m.

Body and Back.—The body should be sponged daily with warm water, and the perineal region must always be swabbed after defæcation or micturition.

On the morning following the operation the shoulders and back must be attended to as follows : The patient is turned on her side and the shoulders and back are first sponged with warm water, then swabbed with methylated spirit or in private eau de Cologne, and lastly dried with equal parts of oxide of zinc and starch powder. This being repeated daily at 7 a.m. and 7 p.m.

CHAPTER XXXII.

ABDOMINAL OPERATIONS.

Time-Table for Nursing and Feeding a Patient after an Abdominal Operation as used by the Author.

Hour.	Directions.	Nourishment.
	TWO NIGHTS BEFORE. An aperient, such as cascara sagrada in some form. **FIRST DAY.**	
5 a.m.		Chicken-tea. Cup of tea, bread and butter, rusk or biscuit.
8.40 a.m.	Hypodermic injection of morphia gr. $\frac{1}{4}$ with atropine gr. $\frac{1}{120}$, or scopolamine gr. $\frac{1}{150}$, or heroin gr. $\frac{1}{12}$ 40 minutes before the operation.	
8.45 a.m.	Catheter if ordered.	
9 a.m.	Operation. When the patient is returned to bed she must be covered with a warm blanket, and hot bottles should be removed from the bed, unless otherwise directed. A pillow should be placed under the patient's knees, a cradle over her abdomen, and her head is to be kept low. If retching or sickness supervenes the patient is to be turned slightly on her left side and her abdomen is to be supported by the nurse laying the flat of her hands on each side of the stitches.	If the operation is at 2 p.m. tea and bread and butter will be given at 6 a.m. and beef-tea at 10 a.m. The catheter, if ordered will be passed at 1.45 p.m. and the hypodermic injection at 1.20 p.m.

Hour.	Directions.	Nourishment.
2 p.m.	Pulse, respiration, temperature. If shock is present a rectal injection of saline solution with glucose ℥ i should be given every 2 hours, to which brandy may be added if necessary. If the patient is unconscious a pint of saline can be given. When conscious 6 to 10 ounces will probably be all she can retain. If the patient complains much of pain when she has recovered from the anæsthetic a rectal injection of aspirin gr. 20, in saline ℥ vi, may be given, and if this does not suffice a hypodermic injection of morphia gr. $\frac{1}{6}$ or $\frac{1}{4}$.	
6 p.m.	Pulse, respiration, temperature. Measure urine when passed. Patient may have one or two pillows.	Hot or cold water (℥i) as preferred to be given frequently to the patient when awake.

FIRST NIGHT.

Hour.	Directions.	Nourishment.
8 p.m.	If the patient is in pain a hypodermic injection of morphia, gr. $\frac{1}{6}$, to be repeated if necessary, may be given. It is best if possible to postpone the administration of morphia till late in the evening, so as to ensure, if possible, the patient having a good night.	A cup of tea may be given, unless the patient prefers lemon water, or she may be allowed to drink ℥ v to ℥ vi of water at a time. Such comparatively large quantities are not so apt to cause sickness as small ones.
10 p.m.	Pulse, respiration, temperature.	

Hour.	Directions.	Nourishment.
2 a.m.	Pulse, respiration, temperature. Pass a catheter if the patient has not passed her urine naturally 12 hours after the operation and measure the amount of urine.	
	SECOND DAY.	
6 a.m.	Pulse, respiration, temperature.	
7 a.m. to 9 a.m.	The patient's hair to be brushed and plaited. Her hands, face, shoulders, feet, and lower part of her back to be washed. The back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. Mouth to be cleansed. Draw-sheet and top-sheet to be changed. The amount of nourishment taken, sleep obtained, and urine passed to be entered in the report book. If the patient passes only a small quantity of urine the catheter must be passed to ascertain if there is any residual urine, and if so the catheter must be used till practically all the urine is naturally evacuated. Save urine for the surgeon. The patient should be placed in Fowler's position unless there is any contra-indication.	Cup of tea and milk with a biscuit or bread and butter.
10 a.m.	Pulse, respiration, temperature.	During the day a glass of milk and soda or barley water or plain water may be given from time to time, as desired, or chicken-tea or beef-tea.

Hour.	Directions.	Nourishment.
2 p.m.	Pulse, respiration, temperature.	
4 p.m.	During the second day flatulence may become troublesome and painful. It is at first felt in the stomach when small drinks of hot water with a few drops of essence of peppermint may relieve it. Later, as the intestine becomes distended, the flatulence is best relieved by passing the rectal tube to allow of the escape of flatus, and if this does not afford relief, a turpentine enema or rectal wash-out should be given before the rectal tube is withdrawn. These measures may be repeated if necessary every 4 hours.	Cup of tea and milk with bread and butter.
6 p.m.	Pulse, respiration, temperature.	
7 p.m.	The patient and bed linen to be attended to as before. The amount of nourishment taken, sleep obtained, and urine passed to be entered in report book.	
	SECOND NIGHT.	
10 p.m.	Pulse, respiration, temperature. Mouth to be cleansed.	
11 p.m.	Aspirin gr. 10.	Drinks of milk and soda or milk and barley water during the night if wished for.
2 a.m.	Pulse, respiration, temperature, if patient is awake.	
	THIRD DAY.	
6 a.m.	Pulse, respiration, temperature.	

Hour.	Directions.	Nourishment.
7 a.m. to 9 a.m.	Morning treatment as before.	Cup of tea and milk. Bread and butter. Boiled egg, if patient would like it.
10 a.m.	Pulse, respiration, temperature. Mouth to be cleansed.	Milk, beef-tea, or chicken broth.
1 p.m.		Fish, calf's - foot jelly or custard.
2 p.m.	Pulse, respiration, temperature. Mouth to be cleansed, wash hands and face.	
4 p.m.		Cup of tea and milk, bread and butter, jam or cake.
6 p.m.	Pulse, respiration, temperature.	
7 p.m.	Evening treatment as before.	Milk or soup.
	THIRD NIGHT.	
8 p.m.	Aperient is given.	
10 p.m.	If the patient is progressing normally omit four-hourly temperature, respiration, and pulse, and take these only twice daily, morning and evening.	Drinks of milk, water or barley water during the night if wished for.
	FOURTH DAY.	
6 a.m.	Simple enema. 1 pint to be given if necessary.	
7 a.m. to 9 a.m.	Morning treatment as before.	Cup of tea and milk, bread and butter, boiled egg.

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Hour.	Directions.	Nourishment.
10 a.m.	Pulse, respiration, temperature.	Milk, beef-tea or chicken broth.
1 p.m.		Fish, custard pudding, piece of bread.
4 p.m.		Cup of tea and milk, bread and butter, jam, cake.
6 p.m.	Pulse, respiration, temperature.	
7 p.m.	Evening treatment as before.	Rabbit, chicken or mince, custard pudding, bread or biscuit.
	FOURTH NIGHT.	Drinks of milk, water, or barley water during night if necessary.
	FIFTH DAY.	
7 a.m. to 9 a.m.	Morning treatment as before.	
8 a.m.		Cup of tea and milk, bread and butter, boiled egg.
10 a.m.	If dressings have been used, these to be renewed. Pulse, respiration, temperature.	
1 p.m.		Lunch.
2 p.m.	Mouth to be cleansed. Wash hands and face.	
4 p.m.		Tea.

Hour.	Directions.	Nourishment.
6 p.m.	Pulse, respiration, temperature.	
7 p.m.	Evening treatment as before.	Dinner.
	SIXTH DAY.	
7 a.m. to 9 a.m.	Morning treatment as before.	Diet as before, and mutton may be substituted for chicken.
	The pulse, respiration, and temperature are to be taken twice daily. Michel's clips to be removed and the abdominal wound to be then painted with iodine solution.	
	SEVENTH DAY.	For this and the following days the ordinary diet may be renewed.
	EIGHTH DAY.	
	Skin sutures, if they have been used, to be taken out.	
	TENTH DAY.	
	If silk-worm gut retaining through-and-through sutures have been used, they should be removed.	
	FIFTEENTH DAY.	
	Patient is lifted onto a couch.	

Hour.	Directions.	Nourishment.
	SEVENTEENTH DAY. Patient may walk about. **TWENTY-FIRST DAY.** Patient goes home.	

This table is meant to serve as a guide only in normal cases, and is that used by the author. The nurse should always ascertain from the surgeon how he wishes his patients to be treated after an operation.

She may, if the surgeon seems to be a reasonable person, suggest to him that, if it would save him trouble, she has a table for after treatment which she was taught. She need not disclose the name of the author. Some surgeons, alas, like some nurses, always appear to be intolerant of accepting good advice.

If post-anæsthetic sickness is troublesome, nourishment will have to be given more cautiously, or even withheld for a time.

Belts.—Many surgeons prefer their patients to wear abdominal belts, for some time after they get up. Other surgeons never advise their use. It is doubtful whether the use of an abdominal belt lessens the chance of a ventral hernia supervening, since the author found, after an examination of the subsequent histories of many hundreds of patients who had had an abdominal operation at the Chelsea Hospital for Women, that as many ventral herniæ occur in patients who wore belts as in those who did not. Some patients, however, feel more comfortable with such a support. In such cases a properly fitting pair of corsets is probably better than a belt.

Getting up.—After abdominal operations, vaginal hysterectomy, and amputation of the vulva, the patient may get out of bed on the 15th day and leave the nursing home or hospital on the 21st. If the patient has suffered from much loss

of blood before the operation, or has otherwise been ill, it will be wiser to keep her in bed a month or so.

After operations for vesico-vaginal or recto-vaginal fistulæ the patient is allowed to get up in 21 days.

After plastic operations and amputation of the cervix the patient should not get out of bed till the 18th day. After dilatation of the cervix in 7 days, and after curetting in 10 to 14 days if the hæmorrhagic discharge has ceased.

If the operation has been undertaken with a view to curing prolapse of the uterus, including cystocele and rectocele, the patient should be warned not to take any form of exercise or work for some time which would involve straining.

CHAPTER XXXIII.

NURSING OF DISCOMFORTS AND COMPLICATIONS AFTER OPERATIONS.

THE nurse should report to the doctor as soon as possible any complication occurring after an operation.

The most common discomforts met with after an abdominal section are: thirst, pain, sleeplessness, certain varieties of vomiting, and distension. Among the serious complications are shock, hæmorrhage, vomiting, distension, peritonitis, intestinal obstruction, cystitis, venous thrombosis, pulmonary embolism, septicæmia and those relating to the abdominal wound.

Pain.—Patients complain on the night of the operation of pain in the back, and abdomen at the site of the incision. This is due, principally, to arching of the back resulting from the Trendelenburg position, and can be to some extent obviated by placing a pillow under the small of the back when the patient is placed in this position. The pain can also be relieved by inserting a pillow under the legs of the patient when she is returned to her bed, which procedure allows the back to lie flat on the bed, and not arched. Pain in the back can also be relieved by placing a small air-cushion or pad under it, and by allowing the patient to lie on her side, but most patients having tried this position prefer the dorsal one.

The surgeon may leave directions that if, in the early hours after the operation, the pain becomes unbearable, the following mixture should be given: potassium bromide grains 40, aspirin grains 30, brandy $\mathfrak{z}$ ss. to saline solution $\mathfrak{z}$ vi, and during the night, an injection of morphia. Some surgeons hesitate to prescribe morphia for pain after the first 24 hours, on the assumption that it favours abdominal distension and masks peritonitis or intestinal obstruction. The author for many years prescribed injections of morphia gr. $\frac{1}{6}$

every 4 hours, if necessary for 48 hours, or if morphia disagrees with the patient, an injection of heroin or omnapon may be successfully substituted. After 24 hours, if aspirin gives relief it may be substituted.

If the patient is very neurotic and restless, and complaining of the greatest agony, although an examination shows that the temperature and pulse are normal, and that distension of the abdomen and sickness are absent, an injection of $\frac{1}{3}$ to $\frac{1}{2}$ grain of morphia is of the greatest value, and will quiet her at once.

If within the first 24 hours there is severe pain, which cannot be attributed to the nature of the operation or to a neurotic patient, the cause may be due to internal bleeding, perforation of the intestine or hæmatoma of the abdominal incision.

Insomnia.—It will depend upon the effect of the morphia injection what amount of sleep the patient gets the first night. Some patients sleep several hours at a stretch, others only for short periods at a time, although they may not be in much pain. When an injection of morphia and atropine has been given in the morning prior to the operation patients will often sleep well on into the afternoon following their operation. Sleeplessness after the first night can be treated on the lines stated on page 317. Persistent insomnia is a bad sign, and apart from being due to the various causes of pain, it is, rarely, the precursor of post-operative insanity.

Shock—Internal Hæmorrhage.—The most likely complications following an abdominal operation of a gynæcological nature within the first few hours are shock and hæmorrhage. These two complications will be dealt with together because there is a certain resemblance between them, and even a trained observer may occasionally be in great doubt as to which of the two the patient is really suffering from, especially when much blood has been lost at the operation, since such a loss is itself a cause of shock. A great responsibility devolves upon the nurse, however, with respect to these two conditions, since she may have the first opportunity of diagnosing them, and her failure to send for the surgeon when the patient is

bleeding may result in the patient's death, whereas by an early intimation many a life has been saved, to the great credit of the nurse's powers of observation.

It will be better to take the signs separately and compare them.

Shock.	*Hæmorrhage.*
Signs date from the operation.	Signs develop after the operation.
Signs tend to get better.	Signs tend to get worse.
Face may be blanched, more often greyish.	Face and lips are markedly blanched.
Skin cold and damp.	Skin cold and damp.
Pulse feeble, as often slow as fast, the cord of the radial artery can be felt.	Pulse feeble, nearly always fast, and the cord of the artery cannot be felt.
A blush can be squeezed into the finger tips.	A blush cannot be squeezed into the finger tips.
The superficial veins are full of blood, especially noted when the veins are exposed for injection.	Superficial veins are collapsed.
Respirations are quick and shallow.	Respirations are laboured, deep and gasping.
Abdominal pain absent.	Severe abdominal pain.
Patient is quiet.	Patient is very restless.
Does not as a rule feel faint.	Always feels faint, and has a feeling of sinking through the bed.
Temperature may be subnormal.	Temperature as a rule subnormal.
The longer the operation and the more severe its nature, the more likely is shock to supervene.	Duration and severity of the operation of no significance, unless it is known that much blood had been lost.
Stimulants improve shock.	Stimulants increase hæmorrhage.

Shock may be due to insufficient protection of the intestines during an abdominal operation. Thus if they project through the wound the surgeon will require sterile towels soaked in warm saline solution to cover them. Shock may also follow a prolonged operation with its attendant anæsthesia, to dragging on the intestines, or to loss of heat, so that the temperature of the operating room should be about 70° F. It may also be due to the loss of blood or to a combination of the loss of blood with one or more of the other factors mentioned.

Internal hæmorrhage may be due to a ligature slipping, to oozing from a raw surface in the pelvis, or to a stitch having

perforated a small blood-vessel. In most cases of post-operative internal hæmorrhage the bleeding will declare itself by symptoms and signs within a few hours of the operation. More rarely after an operation for amputation of the cervix, or for colporrhaphy, there is serious bleeding from the vagina between the 10th and 18th days due to sloughing into some blood-vessel.

TREATMENT.—

The treatment of shock consists in (1) *maintaining the strength of the heart* by adrenalin, ephredine hydrochloride and coramine, or other drugs the doctor may order. (2) In *raising the blood-pressure* by stimulating the heart as in (1) and by intravenous injection of blood, plasma or serum. (3) In *keeping the vital centres supplied with blood* by raising the foot of the bed and administering oxygen in high concentration. (4) Covering the patient with warm blankets and placing well protected hot-water bottles by her side.

The treatment of hæmorrhage is to secure the bleeding vessel as soon as possible and *after* it has been secured to give an intravenous transfusion of blood if obtainable otherwise an injection of banked-blood, plasma or serum.

In the case of serious bleeding from the vagina, after sending for the doctor, should his arrival be delayed, the nurse can give a hot antiseptic douche.

Distension.—Propping the patient in Fowler's position often relieves abdominal distension, and unless the contrary is ordered the nurse should always place the patient in this position the morning after the operation.

Gastric Distension.—This is due to the irritation of the anæsthetic, and may be treated by one or other of the remedies mentioned for the treatment of irritative vomiting.

Flatulent Intestinal Distension.—Post-operative distension of slight degree is not an uncommon condition, especially when the operation has been at all prolonged and there has been much handling of the intestines. The distension, which is due to loss of tone in the bowel-walls, is uniform and soft, and it first appears about 24 hours after the operation. Commencing with gastric distension and, working its way down into the

intestines, it is accompanied by the expulsion of flatus in about 48 hours, if the rectal tube is not used; there is not any tenderness, colicky pain or rigidity of the abdominal walls or visible intestinal movements.

Post-operative distension is also, in many cases, very successfully treated by injections of pituitrin ½ c.c.

Paretic Distension.—Mild degrees of this form of distension are not rare when there has been much handling of the intestines. The distension is uniform and there is no rigidity or tenderness. Another variety is due to adhesions causing a kink in the bowel. The severe form of paretic distension is known as *paralytic ileus*, and usually supervenes about the 4th day after the operation. The symptoms and signs resemble, in some respects, those of intestinal obstruction or peritonitis. Vomiting is at first absent and some flatus may be passed with the rectal tube. The pulse-rate is increased. The distension gradually increases, and the vomiting becomes fæcal.

TREATMENT OF DISTENSION.—

For the less serious causes of distension the frequent use of the rectal tube, the administration of rectal wash-outs, enemata of rue, turpentine, ox gall, a rectal injection of an ounce of essence of pepperment in a pint of water, or the injection of pituitrin are methods, either one or other of which will be successful.

Turpentine enema :—

A good recipe for a turpentine enema is that used at the Middlesex Hospital :—

Turpentine	½ ounce.
Castor oil	1 ounce.
Soap and water	½ pint.
Water and gruel	½ pint.

It is made as follows, the enema being injected as warm as possible : Either by mixing the turpentine in a porringer with a piece of soft soap as large as a hen's egg, then stirring in the oil, and adding the remaining ingredients last, or by beating up the turpentine with the white of an egg, and then stirring in the ingredients.

Rue enema :—

Oil of rue	.	.	.	.	.	20 minims.
Mucilage of acacia	.	.	.	.	.	2 drachms.
Soap and water to	.	.	.	.	.	6 ounces.

In either case, if the enema is not returned the rectal tube is passed to draw it off.
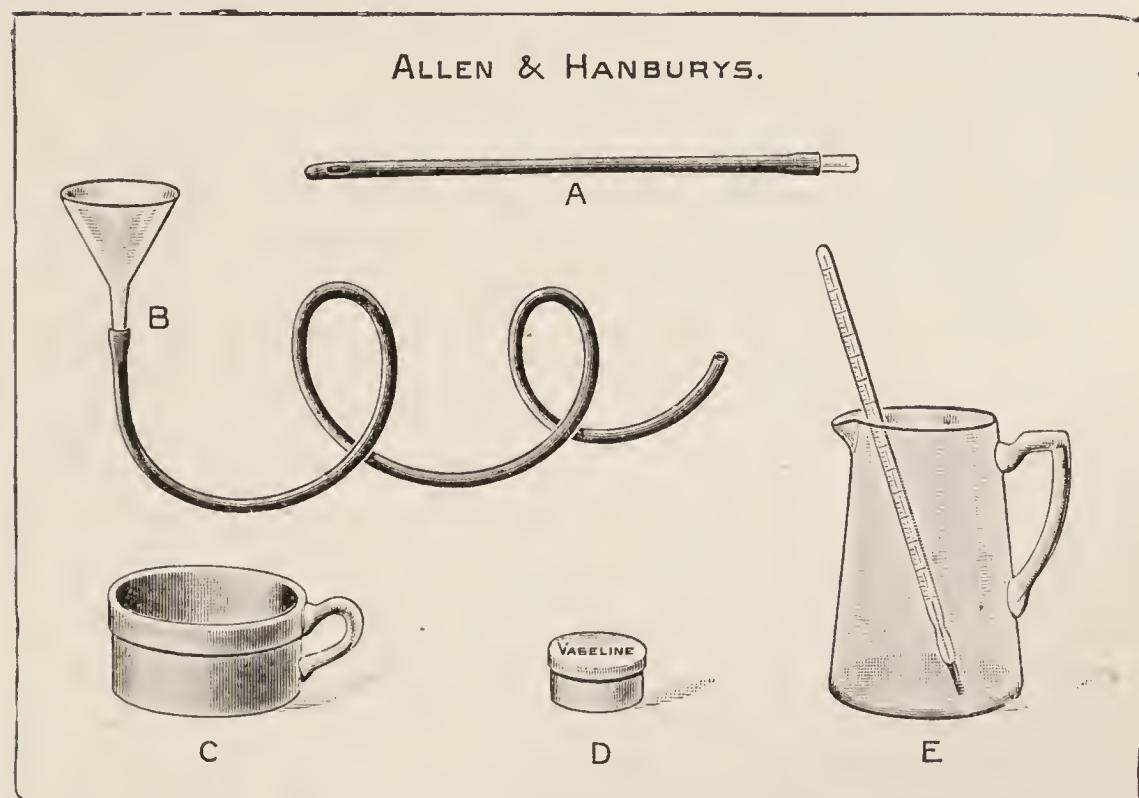
FIG. 65.—APPARATUS FOR GIVING A RECTAL WASH-OUT.

 A. India-rubber catheter and glass joint.
 B. Glass funnel and tubing.
 C. Porringer for swabs.
 D. Vaseline.
 E. Glass or enamel measure with thermometer.

Ox gall solution enema :—

Six ounces of ox gall solution heated by placing the bottle containing it in hot water, and then injecting the ox gall into the rectum, often affords great relief.

Rectal Wash-out.—To give a rectal wash-out a catheter with a glass funnel and tubing fitted to its end by a glass joint are required. It is important before inserting the tube to drive the air out of it. Some of the fluid, therefore, should

be run through the tube which should then be pinched just below the glass funnel, before the latter is quite empty. Two pints of soap and hot water containing 1 ounce of turpentine are then made up, and 6 ounces of this solution are poured into the funnel, which is held as high as possible. The solution having been injected is allowed to remain in the rectum for a few minutes, after which the funnel is lowered into a basin of water and the solution allowed to run out with a consequent aspiration of flatus from the intestine. This is repeated till the 2 pints are used up. It is important that a siphonage action should be established, by not emptying the funnel before it is lowered to withdraw the bowel contents. As a rule, this method of treating the distension is very successful (Fig. 65).

Pituitrin in doses of $\frac{1}{2}$ c.c. and eserine in doses of gr. $\frac{1}{100}$ may be given alternately every 4 hours.

Paralytic Ileus.—The methods of treatment described under the lesser degrees of paretic distension should be given. The application of heat by radiant heat baths every 6 hours for 20 minutes is strongly advocated by some authorities. If the heart is failing camphor and coramine will be given. If improvement does not result the surgeon will perform jejunostomy or ileo-colostomy and cæcostomy, which operations, however, are but rarely successful.

Peritonitic Distension.—Usually during the 3rd day the distension becomes acute and general. There is great abdominal pain, the walls are very rigid, and the patient soon becomes collapsed. As a rule, treatment is of no avail, but rectal washouts and enemas afford the best means of relief. Patients suffering from this form of distension will often pass flatus with the tube till the end, but not naturally.

Obstructive Distension.—The abdomen is hard and tender. The pulse-rate and temperature increase and vomiting is persistent. Since in pelvic surgery the obstruction is generally more partial than complete, the symptoms are sub-acute, and it may be several days before the patient dies. The distension probably passes from the large intestine to the small intestine, and, if the obstruction is incomplete, flatus may be passed and even small portions of fæcal matter. The abdominal pain is intermittent and colicky and intestinal movements

are excited by palpation of the abdomen. The only treatment is to relieve the obstruction by operation.

Vomiting.—This may be due to the anæsthetic, to gastritis, to neurosis, to peritonitis, or to obstruction of the bowels.

Anæsthetic Vomiting.—This comes on early, and lasts, as a rule, about 24 hours. It is very often more of a trying to be sick than actual vomiting, and in many patients appears to be made worse by the smell and taste of the anæsthetic. The patient retches a good deal, and when she does bring up anything it is only a small quantity, a drachm or so at a time, and light green in colour. There is not any tenderness of the abdomen, fever, or increase in the pulse-rate.

A method of treatment, especially if the vomiting is very troublesome, is to wash out the stomach. If the surgeon elects to do this the nurse must prepare, at a temperature of 105° F., 2 or 3 quarts of boric, or saline solution, as the solution will be used until it returns quite clean.

Irritative Vomiting.—This is due to gastric irritation, and is often associated with flatulent distension set up by the anæsthetic. Although the stomach rejects anything that is put into it, unless it be a little peptonized milk, if it is left alone the vomiting will usually cease. It is best treated by withholding all food by the mouth for some hours and giving rectal injections of saline containing 5 per cent. glucose. A soap and water enema will at times stop this variety of vomiting at once. It is often successfully treated by giving the following draught :—

℞ Bicarbonate of soda	.	.	.	. 1 drachm
Essence of peppermint	.	.	.	. 5 minims
Warm water .	.	.	.	. 10 ounces

which generally makes the patient very sick, and so really washes out the stomach. As a rule irritative vomiting does not last more than 24 hours. The pulse-rate and temperature are normal and there is not any abdominal tenderness. It rarely happens that the vomited material may contain a little blood which has escaped from the congested blood-vessels in the wall of the stomach. Failing other unfavourable symptoms, this coffee-colour can be discounted.

Neurotic Vomiting.—This may be associated with irritative vomiting. The patient is continually retching apart from any solid or liquid in her stomach ; she appears to be trying to be sick. An examination of the pulse-rate, temperature, and abdomen fails to disclose any abnormal condition. Neurotic vomiting, which may last for some days, is often accompanied by complaints of great agony and by excitement and lack of sleep. The various remedies already mentioned may be tried, and an ice bag or mustard plaster to the epigastrium may afford relief. Other remedies are a drop of tincture of iodine in a teaspoonful of warm water every half hour, very strong coffee, or an enema of chloral hydrate 20 grains in 3 ounces of water. Whether any one of these remedies will be successful can only be ascertained by trial, often they are useless. In very excitable patients an injection of $\frac{1}{3}$ grain of morphia will usually prove to be the most successful remedy.

Peritonitic Vomiting.—This comes on during the 2nd or 3rd day, the ejected fluid is dark green or brown in colour, and sometimes offensive, at first small in quantity, but later the amount will be very considerable, the patient vomiting as much as half a pint at a time. With it there is no feeling of sickness or effort to eject the vomited fluid as in the case of irritative vomiting ; the fluid simply wells up and runs out of the mouth. The other signs and symptoms which accompany peritonitis are, as a rule, so evident that a mistake cannot be made as to the significance of this variety of vomiting. The treatment is that for peritonitis.

Obstructive Vomiting.—This is due to some portion of the gut having become accidentally included in a ligature during the operation, to adhesions forming among the intestines or omentum after the operation, or to the gut becoming adherent to the top of the cervix after a sub-total hysterectomy.

For the first few days the patient appears to be doing well, and then the vomiting supervenes quite gradually and only at intervals ; it, however, continues to increase in frequency, till at the last it is practically continuous. Although fæcal vomiting is said to be diagnostic of it, the ejected material often does not become fæcal in character till the end is at hand, and on many occasions it does not become fæcal at all.

Obstructive vomiting is always accompanied by abdominal

distension, which gradually becomes more and more marked, commencing, as a rule, over the left abdomen, as it is here, in the region of the sigmoid flexure, that the obstruction most commonly arises.

The treatment is operative to relieve the obstruction.

Intestinal Obstruction.—Intestinal obstruction after an abdominal section may be due to adhesion of a loop of intestine to the pedicle remaining after the removal of a diseased ovary or Fallopian tube, or to the cervix of a sub-total hysterectomy. A piece of intestine may be included in a ligature. Other causes are adhesions forming between different portions of intestine or between intestine and the omentum, or to a knuckle of intestine forcing its way through the fascial incision in the abdomen and remaining undetected.

As a rule the symptoms and signs appear towards the end of a week. In those cases in which a piece of the bowel becomes adherent to the cervix of a sub-total hysterectomy or to a pedicle, it may be several days before the condition of the patient becomes serious.

A patient suffering from intestinal obstruction has colic and intermittent pain of great severity, which is more particularly aroused by abdominal palpation, or by eating and drinking. The pain most often starts in the left iliac region, since this is the commonest site of the obstruction. The abdominal muscles are rigid, there is marked abdominal distension, and palpation often excites intestinal movements. The patient will vomit quite apart from taking anything into her stomach, though she may retain food for several hours before returning it, when a large quantity of the stomach contents is ejected. Towards the end the vomiting is continuous. The vomit becomes brown and in some cases is fæcal. The pulse-rate is markedly quickened; as a rule there is no fever and the temperature may be subnormal. In some cases flatus may be passed after the insertion of the rectal tube, but only in the early stages, and this may lead to a sense of false security.

Retention of Urine.—After any gynæcological operation, and especially after the radical operation for carcinoma of the cervix, the patient may be troubled with retention of urine. The treatment of this complication after the radical

operation is dealt with on page 352. Other methods of treatment are detailed on page 106.

Cystitis.—About the end of the second week after an abdominal section, or a vaginal hysterectomy, the patient may complain of pain on micturition. If the infection is due to the bacillus coli, as it generally is, the urine is found to be acid and to contain a little pus. For the treatment see page 154.

Incontinence of Urine.—The complication sometimes follows Wertheim's operation for cancer of the cervix due to sloughing of, or injury to, the ureter or from sloughing of, or injury to, the bladder. In advanced cases the ureter has, at times, to be dissected from the side of the growth, and in every case 2 or 3 inches of ureter have to be isolated to enable the operator to get clear of the cancerous tissues. It is not surprising, therefore, that at times the ureter sloughs since its blood-supply has been interfered with. If the ureter is injured or sloughs, urine is found to be escaping by the vagina, generally about the 10th day. Likewise the bladder may be injured when it is dissected off the growth, or it may become infected and slough. In the first instance, if the repairing stitches do not hold, or in the second, if the bladder sloughs, a vesico-vaginal fistula results.

The treatment of such a complication requires constant attention. The patient will be much more comfortable if she sits upright on an india-rubber ring and is given baths twice daily, boric lotion douches, and an ointment of zinc ointment and castor oil is applied to the parts over which the urine travels.

The fistula may heal in due course, failing which the patient may be cured by operation or have to use an appliance for the rest of her life. The operations on the ureter consist of implanting the free end of the injured ureter into the bladder or, if this is impossible, the corresponding kidney has to be removed.

Pyelitis.—See page 155.
Suppression of Urine.—See page 112.

Femoral Thrombosis.—About the 13th day after the operation the leg becomes swollen and very painful. The swelling may be limited to the lower part of the leg, or the whole leg may be affected. This swelling pits on pressure, and a hard, tender thrombus can be felt in the femoral vein, and because of the pain the patient is unable to move her leg. The temperature will be somewhat raised. The leg generally remains in this condition for a few days, and then gradually gets better, although in some cases it remains permanently swollen.

Femoral thrombosis, the cause of which has not yet been determined, may occur after any operation and, as a rule, the left leg is affected.

The surgeon may direct the nurse to paint the leg with a solution of glycerine and belladonna, or to apply antiphlogistine and a many-tailed bandage, to prevent unnecessary movement when the limb is bandaged. The leg should be kept perfectly at rest on a pillow, a cradle put over it and sand-bags should be placed each side. The great danger of femoral thrombosis is that the clot in the vein or part of it, on account of some movement of the leg, may become detached from the vein and escape into the circulation, causing pulmonary embolism.

Pulmonary Embolism:—The clot of blood which has become detached from some vein, generally about the 10th day, is then carried with the circulating blood to the heart and may block the pulmonary artery through which the blood is being conveyed to the lungs to be aerated. If the pulmonary artery is entirely blocked the patient dies suddenly. If partially blocked, death may be slower, or the patient may recover. If death is not sudden the patient experiences the greatest difficulty in respiration. She will sit up in bed, gasp, struggle to get her breath, throw her arms about, and the colour of her face, at first blue, gradually becomes grey. If the patient recovers from the immediate attack, she may have an infarct of the lung, which is an area of lung tissue deprived of blood by the blocking of an artery leading to it. In addition to the local signs, the patient will cough up prune-coloured sputum.

Treatment.—The nurse should place the patient on her back and administer brandy, coramine, camphor or strychnine, and

oxygen if available, and a hypodermic injection of morphia gr. $\frac{1}{4}$ to relieve the distress. If the patient stops breathing, artificial respiration should be performed until the heart ceases to beat.

General Peritonitis. — The most frequent cause of death after abdominal section, or vaginal hysterectomy, is septic infection of the peritoneum, which may be due to some flaw in the aseptic technique. Thus, on the occurrence of peritonitis the strictest inquiry must be made into the various details connected with the operation in order that the source of the infection may, if possible, be discovered and so danger, in this respect, to any other patients undergoing operation may be prevented.

Every case of peritonitis, however, is not due to faulty technique. It may be that the abdominal tumour is already infected before an operation for its removal takes place, or during the operation some pus, which has been locked up in an abscess may escape and soil the peritoneum.

The patient is restless, her features are drawn, she has an ashy-grey complexion, she perspires, her extremities are cold, and her tongue is dry and brown. Her mind may be very alert till she subsides into delirium or coma, as a rule not longer than 3 days.

The appearance of general peritonitis is gradual and, as a rule, the symptoms and signs do not become marked until the 3rd day. It will be noticed that the pulse-rate does not fall in the usual way but continues to rise so that it reaches 120 or over. The temperature, which is often not satisfactory from the first, in most cases rises rapidly, to 104° F. or higher. The respirations, which are thoracic only, increase; hiccough is often troublesome, and the tongue becomes dry. Vomiting now supervenes, the vomited matter, which is green or dark brown in colour, being ejected without any effort or feeling of nausea. The amount vomited at a time may be considerable and the stomach cannot tolerate any solid or liquid. In addition there is marked abdominal distension, the walls of the abdomen are extremely rigid and it is greatly tender. The patient complains of agonizing abdominal pain, and lies with her legs flexed to relieve the pain caused by

tension of the abdominal muscles if the legs are kept straight. Painful micturition is often present, leading to retenton of urine. The bowels do not act, and aperients, enemata, or the use of the rectal tube have no effect. In very rapid and fatal cases the temperature may fall below normal, and when suppurating peritonitis is present there may not be any pain or tenderness to speak of.

There are many channels by which a patient may become infected, but the greater the care that is taken in making every step connected with the operation as aseptic as possible, so much the less chance will there be of peritonitis supervening.

Massive collapse of the lungs occurs occasionally after an abdominal operation; one, or both, lungs may partly collapse. This is due to paralysis of the diaphragm or costal muscles The cause is not known. Probably sepsis predisposes to it, also a prolonged pressure of the viscera against the diaphragm in the Trendelenburg position. The attack commences suddenly with a short and frequent cough and considerable dyspnœa. The fever is only slight. The prognosis is good.

Complications of the Abdominal Wound.—

Hæmatoma.— A hæmatoma may be due to some blood-vessel in the abdominal incision not being ligatured because it did not bleed till after the incision was closed. It may also be due to a retaining suture through the abdominal skin, muscles and peritoneum perforating a blood-vessel, the bleeding having escaped notice at the time. There is a certain amount of tenderness, perhaps pain, and the temperature will be ir-regular, without the patient being otherwise apparently ill. If abdominal dressings have been used this complication may not be discovered until they are removed at the end of the week.

The correct treatment is to open up the cavity, scrape out the blood-clot, insufflate aristol and let the cavity granulate up, if it is small. If it is large it should be closed again with silkworm gut sutures.

Abscess.—An abscess of the abdominal wound is generally due to an infected suture or ligature, or to infection of a

hæmatoma. It may declare itself in a few days, or not perhaps for months. Pain and tenderness, a rise of temperature, redness and swelling at some spot along the site of the wound are its leading symptoms. The abscess must be opened. Fever without any apparent cause is an indication that there may be suppuration round a buried suture.

Sloughing.—On occasions, especially if the operation has been a long one and pressure on the edges of the abdominal incision by the retractor has been prolonged, and virulent
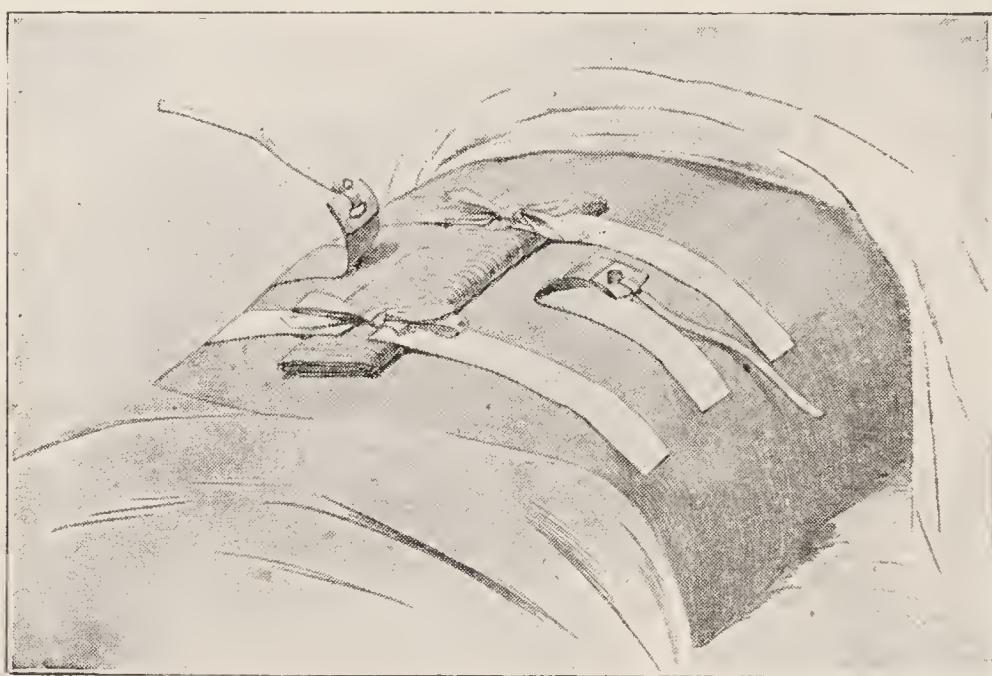
FIG. 66.—ARRANGEMENT OF PLASTER AND TAPES.

Note the free end of the tape turned inwards to prevent it sticking to the dressing and also to form a firmer attachment for the tape.

bacteria are present in the tissues removed, such as occurs in the radical operation for cancer of the uterus, the whole of the abdominal incision will slough. Such a complication is more likely if the resisting power of the patient has been lowered by a severe illness. A high temperature and pain in the region of the wound will lead to its examination. Part of the muscle layer often sloughs and the discharge is extremely offensive. Such a condition will require hot fomentations, together with frequent irrigation with a disinfectant (for which peroxide of hydrogen, 10 volumes, will do very well), till the

wound is clean, after which it must be dressed as the surgeon directs.

The dressing is best kept in place, and the facility with which the wound can be dressed is greatly increased, by the use of tape and plaster. Pieces of strapping 5 inches long by 1 inch broad should be cut and a tape $\frac{1}{4}$ inch broad should be sewn to one end of each. The strapping is then applied to the abdominal wall so that the tape is attached not nearer than 2 inches from the edge of the wound. About six pieces of strapping thus prepared will be required, three on each side. After the wound has been dressed, its free edges can be approximated and the dressing kept in place by tying each piece of tape to the corresponding piece on the opposite side (Fig. 66).

Sinus.—A sinus of the abdominal wound may be due to an infected suture or ligature, in which case, if the suture is loose, it can often easily be removed by a crotchet hook. It may persist for months. The track made by a drainage tube, or a fæcal, bladder or ureteric fistula may lead to a sinus. The two latter complications declare themselves towards the end of the second week, and are preceded, as a rule, by a rise of temperature. In most cases the fæcal fistula closes in a short time, but rarely without further treatment it remains permanent. The ureteric fistula rarely closes.

Bursting.—This, which, as a rule, occurs in the first week, is an alarming complication and is generally due to violent fits of retching, vomiting, or coughing. It sometimes happens when there is marked abdominal distension and it is more likely to supervene if the patient is fat, owing to the sutures tearing out of the tissues. Occasionally the only cause that can be surmized is a too rapid absorption of the parietal sutures when catgut has been used.

Either part of the wound or the whole wound may burst. Partial bursting may not occasion any symptoms at first, and it is not until the pulse-rate rises and abdominal pain is complained of, that the abdominal dressings are removed and a coil of intestine, perhaps partly strangulated, is detected. When the whole wound bursts the patient has a sudden and severe pain and suffers from shock. It is surprising how often partial bursting of the wound has been overlooked in

the first instance.   Fortunately the patient nearly always does well, the fatalities being due to the intestine escaping through the fascial edges of the wound only and then becoming strangulated before the accident is recognized.

When the nurse discovers that the wound has burst she should send for the doctor and then keep the patient absolutely quiet and cover any protruding intestines with a sterilized towel soaked in warm saline.   The dressing should be kept in place by an abdomnal binder.

The surgeon will have to clean the intestine, replace it, and re-suture the wound.

Bed-Sores.

CAUSE.—

Patients are most likely to suffer from bed-sores, unless the toilet of the patient is efficient, and even in spite of this they cannot always be prevented when they are wasted, paralysed, have incontinence of urine or fæces, or irritating vaginal discharges, or who suffer from cardiac, pulmonary, or renal disease.

Bed-sores are more likely to occur in those parts of the body on which there may be undue pressure, such as the ankles, elbows, knees, sacrum or shoulder blades.   In the ordinary run of gynæcological cases, however, they usually appear on the sacrum or back and are due, in most cases, to the nurse neglecting the correct precautions or carrying these out inefficiently.   More rarely, in such conditions as cancer of the uterus, vagina or vulva, or recto-vaginal and vesico-vaginal fistula, the wetting of the bed-clothes and those of the patient increases the risk of bed-sores no matter how experienced and careful the nurse may be.

SIGNS.—

The skin first becomes red, pieces of the skin then become detached, and if this condition is not arrested, the superficial tissues become eroded, leading to inflammation, ulceration and sloughing.

TREATMENT.—

The nurse, during her training, will have had ample opportunities of carrying out the "back routine" under expert supervision. The methods vary at different training schools ; at the Middlesex Hospital the following routine is carried out twice daily on each patient :—

1. The back is thoroughly washed with hot water and soap.
2. The palm of the hand being amply covered with soap lather, the latter is well rubbed in for a few minutes with circular kneading movements.
3. The soap is then quite rinsed off.
4. The parts are then well dried.
5. Lastly, powder is applied by the palm of the hand with gentle tapping movements so that the skin is well covered and stimulated.

Those patients in whom the vulvo-perineal area and buttocks are constantly being kept wet by excreta or irritating discharges are treated by constant change of drawsheets and night dress and, after washing the affected parts with hot water and soap, covering them with an ointment of equal parts of cod liver oil and zinc oxide, the ointment being thoroughly removed before each washing.

If, in spite of such treatment, bed-sores develop, the doctor will prescribe the appropriate local treatment.

In this chapter the common discomforts after operation are dealt with, as well as those complications which, though unusual, a nurse who is engaged in gynæcological or surgical nursing may sometimes meet in her practice.

On occasions the following complications may arise, but there is no need, because of their rarity, to deal with them here :—

Acute nephritis, acute dilatation of the stomach, bronchitis, broncho-pneumonia, cerebral hæmorrhage, cerebral thrombosis, diabetes, emphysema of the abdominal wall, fæcal fistula, gangrene of the bowel, hæmorrhage from the bowel, hiccough, insanity, jaundice, miscarriage, parotitis.

Special Points in the Nursing of a Patient after the Radical Operation for Carcinoma of the Cervix Uteri.

The radical operation for cancer of the neck of the uterus is in most cases more trying to the patient than any other operation concerned with diseases peculiar to women. Indeed, this operation, in an advanced case, is as serious to the patient, and as difficult to perform, as any operation in surgery.

Great responsibility devolves on the nurse who has charge of such cases ; the care of a thoroughly trained and efficient nurse may mean the difference between life and death to the patient.

The following are the chief points to be remembered by the nurse in attendance :—

Shock.—Shock is often considerable and at times very marked. This is due, not only to the severity of the operation, but also because in most instances the health of the patient has already been affected by pain, bleeding, and a septic discharge. In addition many of the patients are past middle age. The usual means of combating shock are stated on page 337.

Infection of the Bladder.—During the operation the posterior surface of the bladder has to be stripped from its attachments. This means that its nerve supply is injured and so, for one or two weeks, the patient is unable to empty her bladder completely, and many of the patients have residual retention. Because of this incomplete emptying of the bladder, and because of the injury to the blood-supply, the bladder is very likely to become infected. Most patients suffer from a little cystitis.

As a rule the urine is not passed naturally for 14 days, and in some cases not until the patient is up. The retention of urine is treated as follows : For the first 2 days the catheter is passed 6 hourly, then 8 hourly. In addition the patient is given a hexamine mixture till her discharge. After the patient passes urine naturally the residual urine is drawn off by catheter. When 3 ounces only of residual urine is obtained the catheterization is omitted except once a day at 6 p.m., until there is not any residual urine, when the catheterization is omitted.

Infection of the Abdominal Wound.—In a certain number of cases the abdominal incision does not heal in the usual way, generally a little local suppuration appears—more rarely about the 4th day after the operation a very offensive brownish discharge escapes from the bottom of the wound. On the doctor separating the skin, the muscle, fat, and fascia will be found to be sloughing. This serious complication, due to the wound being infected by bacteria, results in the patient becoming toxic. For the treatment see page 348.

Diarrhœa.—In certain cases, and this has been noticed particularly when a strong aperient has been given after the operation, the patient suffers from distressing diarrhœa and a certain amount of incontinence of fæces.

This complication may usually be prevented by giving, as the aperient, syrup of figs. If diarrhœa supervenes it is best treated with a mixture of bismuth and opium.

Infection in the Pelvis and of the Remains of the Vagina.— It is not surprising that sepsis, in the region from which the growth has been removed, should occur. A nurse who has seen this operation will remember that the pelvis has been stripped of everything except its muscles, large blood-vessels, important nerves, and the bladder and rectum. A large cavity is thus formed into which the remains of the vaginal canal opens. At the back of this cavity is the raw surface of the front of the rectum, in front is the raw surface of the back of the bladder, and the floor of the cavity is raw. Bacteria from the rectum or from the vaginal canal invading this cavity can thus easily infect it. The remains of the vaginal walls may slough badly, and in these cases it has been noticed that there has always been a bad vaginal discharge or urinary fistula. The signs usually appear about the 5th day with fever, and a foul discharge. The suppuration generally lasts some time, but usually clears up in a month. Rarely the patient succumbs to an intense toxic condition, and very rarely one of the large blood-vessels in the pelvis is opened by suppuration and the patient dies quickly of hæmorrhage.

Burns.—These may occur on the skin of the cheeks, lips, or nose unless a thin layer of vaseline is applied to these sites

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before the anæsthetic is given. Boric-acid ointment should be applied to the affected area.

Serious burns are due to hot-water bottles, and may be occasioned in the following circumstances : When hot-water bottles are placed on the operation table prior to the operation and have not been removed when the operation commences, or when they have been placed by the side of the patient during an operation, or when they have been placed in the bed to which the patient will be transferred after the operation, and not removed when the patient has been transferred. Burns have also been caused by electric cradles.

A serious burn with a hot-water bottle is a catastrophe. It is followed by great pain and suffering, may take months to heal, and has not infrequently resulted in legal proceedings with the award of heavy damages.

The author has never allowed hot-water bottles to be placed in contact with the patient during an operation. If the operating room is properly heated that is sufficient.

The treatment will be directed by the doctor.

Additional Complications.—(Apart from those mentioned on page 334.)

Chloroform Poisoning—This condition is far more likely to supervene if there has been septic absorption before the operation. The cells of the liver are affected so that its function is impaired.

The symptoms and signs, as a rule, appear within the first 48 hours. In the worst cases there is marked jaundice, violent vomiting, hæmorrhage from the stomach, delirium and coma. In other cases the jaundice is absent. The urine contains acetone and diacetic acid.

The treatment consists in the administration of 1 ounce of glucose, 1 drachm of bicarbonate of soda dissolved in 10 ounces of water, introduced every 4 hours into the rectum through a funnel and catheter, or a similar mixture of $\frac{1}{2}$ ounce of glucose, a drachm of bicarbonate of soda to a pint of water given intravenously.

It is a very fatal complication.

Posture Paralysis.—(1) Of the arm, due to the musculo-spiral nerve being damaged by the arm being allowed to hang

over the edge of the operating table, or to the brachial plexus being injured by the shoulder-presses sometimes used to keep the patient from slipping down when in the Trendelenburg position.

(2) Of the leg, due to injury of the peroneal nerve because the leg and not the ankle is secured to the stirrup in the lithotomy position, or to the external popliteal nerve being pressed against the edge of the table when the Trendelenburg tilt is used.

Crushes and Dislocations.—Due to the hands or arms of the patient being caught between the top of the table, as it is being lowered to the horizontal position, and the frame. It is quite easy to dislocate the shoulder unless care be taken when moving the arms, and is likely to happen when the nightgown is being changed at the end of the operation.

Conjunctivitis.—Due to a drop of anæsthetic having been accidentally dropped into the eye. This should be treated by instilling castor oil and 10 per cent. cocaine, bathing with boric acid lotion, cold pads to the eyes, and boric ointment between the eyelids.

Gums, Tongue, and Teeth.—If the mouth gag is not used very carefully the gums may be lacerated, or a tooth may be forced out. The tongue may be bruised if the tongue-forceps are used for any length of time.

Septicæmia.—

SYMPTOMS.—The patient feels ill, complains of headache and of inability to assume any position that is entirely comfortable, so that turning about from one side to another she is deprived very often of that amount of sleep which is conducive to her recovery. The attack, if the temperature rises suddenly, may be accompanied by the distressing symptom of a rigor which makes the patient very exhausted. If the temperature rises more slowly the initial rigor may be absent though, as the disease progresses, repeated rigors even in the absence of pus formation (pyæmia) may occur. The patient, when not sweating, feels hot and dry and complains of thirst, partly because she may be disinclined to drink as much fluid as she should, and partly because of the profuse sweatings which occur. She complains of feeling weak, and

this complaint is intensified as time goes on. She often has a great distaste for food and may complain of terrifying dreams.

SIGNS.—

The patient is restless, her temperature often varies markedly, since in the morning it may be as low as 99° F. and in the evening as high as 104° F., quite apart from the serious rise and fall accompanying a rigor. The pulse-rate is often 100, may rise to 130 or 140, and while at first the pulse is full and bounding, as time goes on it becomes smaller and its rate more rapid and irregular. She suffers from profuse sweating, apart from the rigors, and may have an irritating heat rash. Her tongue is dry and coated, and either brown and cracked or red and shining, and sordes are apt to collect on the lips. At the commencement of the attack the patient may vomit, and this symptom, if the disease is prolonged, may return. Her urine is scanty and high coloured, and if the kidneys are affected will contain some amount of albumin. The loss of flesh is noticeable, and with the disease going from bad to worse, the patient becomes listless, sinks down in the bed and is delirious at night. Diarrhœa, a distended abdomen and hiccough may supervene and in themselves are bad signs.

Pyæmia.—During the course of the illness pyæmia, which indicates the formation of local abscesses, may be superadded to the septicæmia. Pyæmia is due to part of a septic thrombus breaking off the clot, and being carried by the blood-stream till at last it arrives at some part in the body where the blood-vessels are so small that its progress is arrested. Suppuration then takes place at this spot and an abscess is formed. The commonest sites for such abscesses are in the joints, pleural cavities, and kidneys, as in these situations the vessels are very small. Abscesses may also form in the subcutaneous tissue or in that between the muscles. The arrest of such a septic embolism may be heralded by the patient complaining of a sudden pain in some portion of her body, but this is not always so, and an abscess may form without the doctor, nurse or patient, in the first instance, being aware of the fact. Pyæmia is generally accompanied by a series of rigors which, in a few days, are followed by the appearance of abscesses, but not always so.

Treatment.—

The doctor will prescribe sulphapyridine or sulphathiazole as the case may be.

Most doctors will prescribe a certain amount of alcohol. The worst case the author ever treated was that of a lady who was removed from a Twilight Sleep Home. She was in bed altogether 16 weeks. During this time she had repeated rigors, abscesses in several joints of her limbs, which had to be opened, including one which destroyed her hip joint. She had abscesses in her muscles which were opened, an abscess in the region of her trachea which nearly suffocated her, one eye-ball was destroyed and had to be removed, and later she had to have a resection of her hip. This patient was determined to get well, ate everything she was asked to, and drank a bottle of champagne a day, and over a bottle of brandy a week. The author is convinced that it was the food and alcohol that enabled her to resist successfully the infection, though some might contend that as regards the alcohol the recovery took place not because of it but in spite of it. At any rate the great pain and collapse following dressing of the abscesses necessitated the administration of a stimulant or an anæsthetic, and considering the frequency of the dressings there can be no doubt which was best. Perhaps the alcohol did more good because, up to the time of her illness, the patient was a tee-totaler.

If any abscesses form the doctor will have to open them, and the nurse must be ready with the necessary dressings and appliances, other than those the doctor provides. The bowels will require constant attention, as very often these patients are constipated, necessitating the administration of aperients, while on the other hand diarrhœa may supervene, a bad sign, which the doctor will treat. The doctor will also be called upon to prescribe for headache and sleeplessness.

In some cases one or other of the joints will become in-flamed, or some other part of the body, without the formation of an abscess. The pain resulting can be relieved by hot fomentations or turpentine stupes and, if there is inflammation in the pelvis, hot douches, 115° F., will be found very useful. The skin on the inner surfaces of the thighs in some women is very tender, and the repeated administration of douches

at this temperature will often cause great discomfort, or even severe pain and soreness. Such a complication can be avoided by smearing the vulva and inner surfaces of the thighs and buttocks with vaseline or zinc ointment.

NURSING.—

The principal object in the treatment of septicæmia is to make every effort to assist the body-cells and body-fluids of the patient in their endeavour to modify the disease or destroy the invading bacteria by the production of acquired immunity. This depends a good deal on the nurse so that she must do everything in her power to encourage the patient to take sufficient nourishment, and in this case sufficient nourishment means as much as the patient can take without upsetting her digestion. It is a well-known fact to medical men that, taking all cases, those patients suffering from septicæmia who consume the most nourishment do the best. It may require constant endeavour, much patience, and great tact on the part of the nurse to persuade the patient to take the proper amount of nourishment but, in most cases, if the nurse is a good one, this can be done. The doctor will direct the nurse, in the main, what food to give the patient, but the nurse herself should be of the greatest value in this respect, by suggesting various articles of food and changing the diet at fairly frequent intervals.

In the case of an acute illness accompanied by fever the natural functions of the body, including digestion, are upset, and it is, therefore, necessary to give such patients liquid diet of a very digestible character. Moreover, many of the articles given as liquid diet are only stimulating, and have but very little or no nourishing properties. If septicæmia does not lead to a fatal termination in a week or two the patient is in many cases a long time, perhaps several weeks, before she gets well. During this time the patient may have a high and irregular temperature. In such cases patients should have any article of diet they fancy, within reason, and, as a rule, they are able quite well to digest solid food of a suitable character.

It is very important that such a patient should sleep well; the ability to take nourishment will favour this, and also the

more comfortable the nurse makes the patient, the more likely is the latter to get proper rest. The mouth will probably be very dry, and dead epithelium is apt to accumulate on the lips. The nurse, therefore, should be very careful to keep the teeth and mouth as clean as possible by brushing and gently washing them with glycothymoline, while the patient should be encouraged to wash out her mouth at frequent intervals with some mild antiseptic such as boracic acid lotion. If the lips are cracked a solution of glycerine of borax will be found very useful.

The room must be kept well aired, and so long as the patient is properly protected with screens and kept warm, it is best to have the window open. If possible a room should be chosen into which the sun, if there is any, can penetrate. In the summer, if the patient is well wrapped up and kept warm with a good supply of protected hot-water bottles, her bed may be wheeled to an open window, or balcony, or even into the garden where she will get the maximal amount of sun and fresh air.

As septicæmia depresses the resisting powers of the patient very much and the patient may be a long time in bed, sores are apt to form on the back and especially over any bony prominences such as the hip bones and sacrum when, if there is any diarrhœa, unless the parts are kept scrupulously clean the chances of bed-sores are greatly increased. The nurse must be most constant and energetic in her treatment of all bony surfaces every day. If possible the patient should have a water-bed to lie upon, the position of the patient should be changed frequently, and her legs should be moved daily as they are very apt to get stiff.

The nurse when she is attending to the patient must be careful to notice, from day to day, whether there is any soft swelling (abscess) in the subcutaneous tissues, since she is much more likely to discover such a swelling, which often appears without pain, than the doctor. An early report thereof to the doctor may save the patient much suffering.

The distressing symptom known as a rigor may leave the patient exhausted. The sudden rise in temperature causes the patient to feel cold and the shivering is very distressing. At this time hot-water bottles and an extra blanket should

be provided and the patient should be given a little alcohol in hot milk or water. After the attack has passed off the patient will feel very hot and the hot-water bottles and extra clothing will have to be removed. With the fall of the temperature the patient will perspire profusely. Her nightgown will become wringing wet and perhaps the sheets. The patient should be made as comfortable as possible by removing her nightgown, carefully drying her body, and putting on a clean nightgown and fresh bed-linen when necessary. If the temperature keeps high the doctor may order the patient to be sponged or to have a cold pack—the method of so doing the nurse will have learned in her general training.

The nurse must remember that if the microbe from which the patient is suffering has a chance of infecting herself, she too may get septicæmia. This will only happen if the nurse is careless in not protecting her hands if she has any scratches on them. The best way to protect the hands is to wash them carefully before and after attending to the patient, soaking them in some antiseptic such as dettol after the washing with soap and water, and to wear rubber gloves if the patient has any abscess discharging, or discharge from the genital passages.

The well-being and comfort of a patient suffering from septicæmia, and her recovery, will be due as much to the attention of the nurse as to that of the doctor. The patient must be kept as cheerful as possible, and much patience and an ability to pay the greatest attention to the smallest details, apart from sound professional knowledge, is required of any woman who undertakes to nurse a patient suffering from septicæmia.

APPENDIX I.

MICRO-ORGANISMS.

THE following classification is the easiest for the nurse to understand, and it is as correct as any other. A microbe, which is either a *bacterium* or *protozoon*, belongs to the lowest form of life and consists of a single cell. A bacterium is the lowest form of vegetable life and a protozoon is the lowest form of animal life.

Pathogenic microbes are those which affect adversely the health of animals and plants, and, according to our present knowledge, there are only a comparatively few varieties which invade the human body. The majority of microbes are harmless to human beings.

BACTERIA.

The word bacterium means a rod, and this term was given to the first bacteria seen because they looked like little rods. In due course it was discovered by biochemical, cultural and microscopical investigations that there were many varieties of bacteria, which term, by common usage, now denotes bacteria as a whole.

THE MAIN VARIETIES OF BACTERIA.

These are divided into two groups, *saprophytes* and *parasites*.

Saprophytes.—The number of these is enormous and they are universally present. In their absence, vegetable and animal life would be impossible, forming a link as they do between the vegetable and animal kingdoms.

So far as the human body is concerned they live on the surface of the skin and in the mouth and bowel.

Saprophytes do not produce any poisons. Living on dead animal and vegetable material, by their action, they destroy such material, which would, otherwise, encumber the earth. In addition, however, to such destructive action, saprophytes produce products of the greatest value. Thus, as a result of their fermentative and putrefactive action the protein of the dead material is converted by the bacteria of the soil into nitrites and then into nitrates. The nitrogen from the nitrates is converted by plants into new protein. Moreover, saprophytes are responsible for the ripening of butter, cheese, jam, tea and tobacco, the formation of alcohol and vinegar and the manufacture of certain explosives and paints.

Saprophytes do not cause disease, in contra-distinction to parasites, which do.

Parasites.—Fortunately these form a very small minority of the total number of bacteria, since most of them are harmful, or pathogenic, as they are termed. We need only deal with those bacteria of medical interest. They belong to the lowest form of vegetable life, and consist of protein, fat, carbohydrate, mineral salts and, mostly, of water, which is the medium through which they obtain their sustenance.

Parasitic bacteria are classified into two groups. The one, *obligatory*, which are never present in the body unless the immediate cause of infection, and *facultative*, which can be present in the body, such as the bacillus coli found in the intestine without doing any harm, but which, in certain circumstances are responsible for disease of the kidneys, bladder and puerperal sepsis. A bacterium consists of one cell only without a nucleus. The outside of some bacteria being of thicker consistence, forms a capsule which affords a certain amount of protection from their enemies. Differing in size, shape and assuming various forms, bacteria by their microscopical appearances are identified as bacilli, cocci, spirochætes or vibrios.

BACILLI.—These are cylindrical or rod-shaped, the colon bacillus and those of diphtheria, dysentery, infantile diarrhœa, leprosy, paratyphoid, plague, soft sore, tetanus, tubercle, typhoid and whooping-cough being examples.

COCCI.—These are oval in shape and assume different forms. Thus *streptococci*, of which there are many groups, are identified as long or short chains. Group A streptococci

(termed the hæmolytic streptococcus because it dissolves red blood-corpuscles) are responsible for most of the severe human infections, including cases of puerperal sepsis. *Staphylococci* form grape-like clusters, and like the streptococci may be the cause of tonsillitis, infective endocarditis and other forms of septic infection; *diplococci* form pairs and include the organisms which are the cause of epidemic cerebrospinal meningitis, gonorrhœa and pneumonia; and *sarcinæ*, a mould, which divides into cubes of 8 or multiples thereof. All cocci are pyogenic, that is, capable of causing the formation of pus.

Included in the cocci is a subgroup called the Brucella, consisting of *Brucella melitensis*, the organism of Malta fever, the infection being conveyed by goat's milk; *Brucella abortus*, the infection in this case being conveyed by cow's milk; and *Brucella porci*, the same infection in pigs. Brucella is the cause of undulant fever in human beings. In human beings the illness lasts on an average 12 weeks, with fluctuating temperature and occasional mild rigors, which signs have not infrequently been attributed to some other cause.

SPIROCHÆTES, the cause of syphilis, are twisted or spiral-shaped. They are the cause of infective jaundice, rat-bite fever, relapsing fever, syphilis, tick fever, yaws and yellow fever.

VIBRIOS, the cause of cholera, are comma-shaped.

THE NECESSARY CONDITIONS FOR BACTERIAL GROWTH.

In common with all living things bacteria require the following :—

Warmth.—Each variety of bacteria has its own optimal temperature. The most favourable temperature for bacterial infection is that of the normal temperature of the host which they are invading, thus in the case of human beings 98·4° F. For each variety there is a maximal and minimal temperature beyond which they cannot flourish. Although reproduction ceases at the maximal and minimal temperatures, this does not imply that above or below these temperatures bacteria are necessarily killed. They are, however, better able to withstand low temperatures than high ones, and the latter, if

prolonged, will kill them, as in methods of sterilization. Most bacteria are killed by a temperature of 150° F.

The terms *disinfectants* and *antiseptics* are used somewhat loosely. The former are substances which destroy bacteria but not their spores; the latter are substances which hinder the growth of bacteria but do not kill them. Although the above are the exact definitions of the words, in midwifery and surgical practice an antiseptic is, by common usage, taken to mean some chemical solution or preparation which will kill bacteria. *Sterilization* entails the destruction of bacteria, and their spores, by heat.

Moisture.—So long as bacteria are kept free of moisture they are unable to multiply.

Light.—Bacteria grow best in the dark, and most of the bacteria are killed by sunlight. A room into which plenty of sunlight can penetrate is, therefore, more healthy than one in which little or no sunlight gains entrance.

Atmosphere.—Some bacteria can only multiply in the presence of oxygen and are termed *aerobes*, others are unable to grow in its presence, and are termed *anaerobes*, and still others, although they multiply better in the presence of oxygen, can do without it and are termed *facultative anaerobes*.

OTHER CHARACTERISTICS.

Reproduction.—Under favourable conditions a bacterium divides into 2, then into 4, then into 8, and so on. This division continues very rapidly until they are unable to obtain sufficient nourishment and so die. Otherwise it has been stated that " in 3 or 4 days a mass the size of the world could be produced ".

Pigmentation.—A few bacteria produce, in fluids or tissues, pigments. Thus bacillus pyocyaneous, found in discharges from the ears, nasal sinuses, and the genital urinary tract, forms a green pigment; staphylococcus aureus a yellow, and the streptococcus viridians (commonly found in the mouth) green.

Motility.—Some bacteria are able to move by means of their protoplasm or by slender processes, termed flagella, attached either to one or both ends of the cell or all around it.

Streptococci and staphylococci are non-motile. Spirochætes progress by movements of their bodies, and bacillus coli and vibrios by means of their whip-like flagella.

Phosphorescence.—Certain vibrios, attaching themselves to sea-fish, cause phosphorescence which, on occasions, can be seen when looking at the sea at night.

Spores.—Certain parasitic bacteria, if their food becomes exhausted, pass into a resting stage, the bacterium being converted into an oval body with a very resistant capsule. These spores are difficult to destroy, surviving a temperature which would have killed the usual form of the micro-organism, and necessitating a temperature of 212° F. for some minutes before they are destroyed. When their environment again becomes favourable the capsule bursts and the bacterium reappears and commences to multiply.

Symbiosis.—A term signifying the living together of two organisms for their mutual advantage. The only important example of symbiosis in medicine is a disease termed Vincent's angina, in which a spirochæte and a bacillus are responsible for the infection.

Secondary Infection.—In this case the growth of the original infecting organism is overshadowed, or destroyed, by other invading organisms which are in the neighbourhood. Gonorrhœa is a case in point, the gonococci soon disappearing, and the ultimate results of the infection are mostly, with rare exceptions, entirely due to the secondary infection.

IDENTIFICATION OF MICRO-ORGANISMS.

Microscopical.—By examining a wet specimen under the microscope, notably the spirochæte of syphilis.

Staining.—When dried on a glass slide and stained by one or other of the aniline dyes.

Cultivation.—The specimen is added to a culture medium which may be fluid or solid according to the micro-organism to be identified. The colonies of bacteria can then be detected by their size, shape, colour and consistence. If one particular variety has to be studied, it is added to a fresh culture medium and further examined.

ULTRA-MICROSCOPIC BACTERIA.　VIRUSES.

All bacteria which have been identified, and are responsible for most of the infective diseases, will pass through the interstices of a filter until they are so small that the bacteria are prevented from escaping .

Some bacteria are so minute that they can only be detected by the highest powers of the microscope. If one of these bacteria were magnified to an inch in length and a man of average height could be magnified to the same extent, the man would be 25 miles high.

There are a few diseases, however, such as the common cold, influenza, measles, mumps, rabies, smallpox, chicken-pox and others, in which the causative bacteria, if any, have not been identified (ultra-microscopic). If the discharge from persons suffering from these diseases is passed by suction through a filter, the interstices of which are too small to allow of the passage of identified bacteria, the presence in the filtrate of a *virus*, which is the term used for the presumed bacteria, can be demonstrated by injecting the filtrate into animals which, if they are susceptible, will then acquire the disease.

WHAT DOES THE ULTIMATE RESULT OF PARASITIC BACTERIAL INFECTION DEPEND ON ?

Their variety, dose, and virulence, and the defensive powers of the host.

Variety.—This has already been dealt with.

Dose.—The larger the dose the more serious it is for the patient.

Parasitic Bacteria.—These cause disease by the poisonous substances they produce, termed *toxins*. They are also termed *antigens*, since they impel the reticulo-endothelial cells of the patient (cells of the bone-marrow, liver, lymph-glands and spleen) to produce neutralizing agents termed *antibodies*. Each variety of micro-organism produces its own particular antigen for which the patient must produce its own appropriate antibody, e.g. the antigens and antibodies of diphtheria are quite different from those of typhoid fever.

Bacterial Antigens.—These are chemical substances which poison the host and are of two kinds, exotoxins and endotoxins.

Exotoxins.—These have characteristic actions and properties, not only in the human body in cases of infection, but also in the test-tube from specimens taken in the case of animals infected experimentally. It is generally considered that exotoxins are secreted by living bacteria. This is probably so in most cases, but in diphtheria, for instance, it would appear that a greater quantity of exotoxins can be extracted when the bacteria are dying or dead.

Endotoxins.—While exotoxins are filtrable from test-tube cultures, endotoxins are not. The latter are so intimately bound up with the bacterial cells that they can only be detected in a test-tube after the bacteria have been ground up and destroyed.

Aggressins.—These can be obtained only from the plasma of the host. They do not act on the tissues of the host but take their part in the attack of the bacteria by interfering with the action of the leucocytes. It is thought that they encourage the quicker reproduction of the bacteria and also increase their virulence, so tending to aid a fatal issue.

Hæmolysin.—This antigen dissolves red blood-corpuscles. This action is not a property of all bacteria, e.g. only some varieties of streptococcus are hæmolytic, and a demonstration of hæmolytic powers is, therefore, used as a means of diagnosis.

Virulence.—This varies widely according to the variety of the bacteria, the hæmolytic streptococci being the most virulent in puerperal infection. Moreover, the virulence of bacteria increases on their transference from one host to another, which has an important bearing on midwifery practice. Thus the first case of puerperal sepsis a midwife may have in her practice may be slight. If she fails to take all the precautions she has been taught, and which are set out in the Regulations of the Central Midwives Board, before attending to another patient, any streptococci which she may convey from the first patient to the second, from the latter to a third, and so on, will increase in virulence with each transfer. Thus epidemics of puerperal sepsis have occurred in the practice of ignorant or careless midwives, leading to many deaths, before the midwife was identified.

Defensive Powers of the Host.—These include the skin, leucocytes and immunity antibodies.

Skin.—If the skin is healthy and unbroken, bacteria are unable to penetrate the hair follicles and sebaceous glands.

Leucocytes.—In most bacterial infections, the leucocytes, or white blood-cells, are enormously increased in number. Their action is two-fold : on the one hand to establish phagocytosis, and on the other to build a fence round the site of infection with the object of preventing the bacteria invading the blood-stream. Before the phagocytes can digest the bacteria the latter have to be prepared by the opsonin. During the battle a number of leucocytes are destroyed and these, together with dead and living bacteria and serum, form pus.

Antibodies.—The neutralizing agents produced by the host are termed antibodies, of which there are two varieties— antitoxic and antibacterial. Antitoxic antibodies are termed antitoxins. They have no special nomenclature and differ according to the nature of the infection. Antibacterial antibodies are not concerned with neutralizing the toxins but act directly upon the bacteria by their agglutinins, precipitins, bacteriolysins, opsonins, and complement.

Agglutinins.—The action of agglutinins outside the body is to cause bacteria to stick together, or clump as it is termed. This action has never been demonstrated in the blood as it flows in the living body, and so it is not known to what extent agglutinins are responsible for the defence of the host. Perhaps there are not sufficient bacteria in the blood, since it is known that agglutinins act on a particulate substance. Thus if a rabbit is experimentally infected so that its blood contains a vast number of bacteria (which results in a marked accumulation of agglutinins), and the serum of the rabbit is mixed with certain bacterial cultures, then bacteria will be clumped. The presence of agglutins in the blood-serum of an infected patient can thus be used as a method of diagnosis, since, in certain diseases such as syphilis (Wassermann test), paratyphoid, typhoid and cholera, if this serum is mixed with a culture of bacteria known to cause one or other of these diseases and the bacteria clump, the nature of the infection is known.

Precipitins.—The information available with respect to the action of precipitins appears to indicate that it differs but little from that of the agglutinins, except that it acts on a non-

particulate substance. Thus if a culture of bacteria are ground up and mixed with the serum of an infected person, or that of an immunized animal, a precipitate results known as the precipitin test. Its action cannot be demonstrated in the living body. Precipitins, however, have an important medico-legal interest. Thus it is possible by the precipitin test to discover whether a bloodstain on clothes, or elsewhere, is human or otherwise ; whether a sausage contains the flesh of a horse, or a rabbit pie that of a cat.

Agglutinins and precipitins appear in the blood-stream only as the result of antigens.

Bacteriolysins.—These destroy and then digest the bacteria.

Opsonins.—This term is derived from the Greek, meaning a relish or appetiser. It prepares the bacteria for ingestion by the phagocytes.

Complement.—Without this the bacteriolysin cannot act.

Opsonins and complement are always present in the blood to a greater or lesser extent.

The Avenues of Parasitic Infection.

Contagion.—That is direct contact with an infected person, as in venereal disease.

Ingestion of contaminated food or water, as in typhoid fever.

Inhalation.—The parasitic bacteria, or virus, is inhaled in the spray resulting in coughing, laughing, sneezing, spitting or talking, as in the common cold, measles, pneumonia, tuberculosis and whooping-cough. The so-called droplet infection.

Inoculation of a wound, as in local or general sepsis ; by the bites of insects, as in malaria and yellow fever, of lice in typhus and of fleas in plague.

Indirect contact, as in midwifery practice, for instance, the doctor or midwife conveying to the genital tract bacteria on their fingers or instruments.

What are the Effects produced by Bacterial Infection ?

Saprophytes.—These have already been dealt with.

Parasites.—These effects are local or general.

Local infection.—Inflammation signifies a local reaction of the tissues of the host to exterminate an irritant, in the case of an infective irritant, the parasitic bacteria. There result the classical signs of inflammation, namely heat, pain, redness, swelling, and tenderness.

The bacterial antigens cause the capillaries at the site of the infection to dilate which, together with the quickened action of the heart, leads to a greater amount of blood locally than is normal, which accounts for the redness and heat. In addition, the cells lining the capillaries, being stretched, are more loosely attached to each other so that serum and corpuscles can escape into the surrounding tissues, which accounts for the swelling and, by its tension, for the pain and tenderness. There are four varieties of leucocytes but those principally concerned are the phagocytes, termed polymorphonuclear leucocytes, their action being to ingest the bacteria and form a protective fence. Normally, the lymph escaping from the capillaries into the tissues is then removed by the lymphatics, but in the case of local infection the amount of serum thus escaping is such that it cannot all be carried away by the lymphatics, which is fortunate since the serum is an important factor in the defence of the host because of the antibodies it contains. In some cases an abscess forms locally.

So far as the patient is concerned, apart from the local condition, he or she suffers only from the absorption of the toxins, since the parasitic bacteria do not invade the tissues, except a few which are ingested by the phagocytes and do not enter the blood-stream. The condition of the patient is termed *toxæmia*. The result to the patient depends solely on the quantity of toxins absorbed, since toxins cannot multiply in the blood.

General Infection.—In this case the bacteria are so virulent, and the resistance of the patient being lowered, the micro-organisms overwhelm the local defensive powers of the host. The leucocytes, being paralysed by the toxins, are unable to form a fence to prevent the invasion of the bacteria. The latter, therefore, enter the circulation through the veins, and multiply, so that the blood now contains not only the toxins, but also the bacteria with their antigens. Moreover, the bacteria being carried to all parts of the body in the circulation

escape therefrom into the tissues. Red blood-corpuscles also escape into the tissues and form red patches of ecchymosis, or petechiæ as they are termed, on the serous membranes and occasionally under the skin. This condition of general infection is termed *septicæmia*.

Both in toxæmia and septicæmia the vital centres in the medulla of the brain are affected by the toxins, the temperature being raised, and the heart-beat is quickened so that more blood is pumped to the affected area. The temperature induces sweating, which is one means of getting rid of some of the toxins. In toxæmia this action on the vital centres is not so marked as in septicæmia, and in the latter the functions of assimilation and excretion are handicapped so that the liver and kidneys may be affected, and in serious cases the urine may be suppressed.

In some cases of septicæmia, more often when the infection is due to the staphylococcus, clots containing bacteria are formed in the veins. Owing to the action of the bacteria these clots are soft, become easily detached from the vein, and so are carried to various parts of the body in the blood-stream —some by the systemic veins to the right side of the heart, others to the left side of the heart, e.g. in lung infections, till they arrive at vessels too small to let them pass. These clots are termed *emboli*, and may be found in the joints, kidney, spleen, and subcutaneous tissues. At the site of their arrest the parasitic bacteria form abscesses. This condition is termed *pyæmia*, which is not, however, a separate entity but merely one variety of septicæmia. Whether a patient develops pyæmia or not depends on the virulence of the bacteria. If the bacteria are very virulent there is no time for pyæmia to develop before a fatal termination of the illness. Should pyæmia develop it generally does so between the 10th and 14th day of the illness and may be fatal or the cause of a very serious and prolonged illness.

IN WHAT CIRCUMSTANCES MAY PEOPLE HARBOUR PARASITIC BACTERIA AND BE A DANGER TO OTHERS — SO-CALLED CARRIERS ?

1. Those who are immune and so the bacteria are harmless to the host. These may be termed healthy carriers.

2. Those who carry *commensals*, which are parasitic bacteria leading a saprophytic life. A large number of people carry streptococci and pneumococci in their respiratory passages, everyone bacillus coli in their intestinal tract, and staphylococci on their skin. Such commensals are, however, potentially virulent, so that they may assume virulent properties in certain circumstances as follows :—

(*a*) By transference to another part of the body. Thus the genital tract may be infected by streptococci ; the bacillus coli may escape from the intestinal tract and, infecting the bladder or kidney, cause cystitis or pyelitis respectively, and the skin of the diabetic may be open to invasion by staphylococci, causing boils or carbuncles, according to whether the inflammation is superficial or deep.

(*b*) By a lowering of resistance of the host, so that pneumococci may cause pneumonia, or streptococci puerperal sepsis in a puerperal woman whose resistance is lowered by hæmorrhage, trauma or the toxæmia of pregnancy.

3. Those who are suffering from an acute infection, say of the respiratory tract or some other part of the body.

4. Those who continue to harbour the bacteria after an acute infection, examples of which are typhoid and streptococcal carriers.

5. Those who are incubating an acute infection.

6. Those who convey an infection from one person to another by direct transference. Examples of this would be a doctor or midwife attending one patient with puerperal sepsis and infecting another.

Immunity.

If an individual incurs the risk of " catching " a disease and does not, he or she is said to be immune. This does not mean that such a person is proof against all diseases, since some people are immune against one disease but not against another. Immunity is either natural or acquired.

Natural Immunity.—This is associated with age, family and race. It is enhanced by nourishing food, temperate habits, fresh air, a proper amount of exercise and rest, and a healthy environment. The converse will diminish natural immunity

as also will intemperance and chronic disease by impairing the vital functions.

Natural immunity, while depending on the presence of antibodies in the blood which act in association with other agencies, also depends on the dose and virulence of the bacteria. Thus a person who pricks his or her finger with an infected pin may have sufficient local resistance to resist the bacterial action, or to prevent the infection spreading farther than the arm, or at most to the lymphatic glands in the axilla. If, however, the general resistance is lowered, the infection may spread all over the body. Many a doctor has died in a day or two from pricking his finger at a post-mortem examination on a case of virulent streptococcal infection.

One of the reasons why breast-feeding is so important for a child is the immunity it obtains from its mother's milk.

Acquired Immunity.

(a) **Active**.—This may be permanent or lasting for a long while by the stimulation of the antibodies in the patient—

(1) As the result of an attack of a disease.
(2) As the result of the administration of vaccine.

Vaccines.—These are preparations of antibodies. Dead bacteria are so treated that their chance of causing the disease is prevented, but the antigens impel the host to produce antibodies. Vaccines are used very successfully as a prophylactic for typhoid, paratyphoid, cholera, and less so in common colds and influenza.

Acquired immunity could, presumably, be induced by infecting a person with a mild attack of a disease if this were not dangerous. This method is, nevertheless, employed as a prophylactic against smallpox and rabies.

(b) **Passive** as the result of administration of antibacterial and antitoxic sera. This is only temporary.

Antitoxic serum is obtained by injecting into a horse a very small dose of the toxin from a culture of the bacteria causing the disease, e.g. the organisms of diphtheria and tetanus. This dose is gradually increased until the blood of the horse

contains a maximal amount of antitoxins. Specified quantities of the serum drawn from the horse are then injected into the patient whom it is desired to protect from diphtheria or tetanus. Antitoxic serum is also used in cases of gas gangrene and snake-bites.

Antibacterial serum is obtained in a similar way except that in this case dead bacteria are injected into the horse. The serum which contains the antibodies is used to assist the defensive powers of a patient suffering from streptococcal, pneumococcal, meningococcal, cholera or anthrax infection.

Virus Immunity.

In this case living virus must be injected, but so treated that it will not give the patient the disease. Smallpox (vaccination), rabies and yellow fever are thus treated as a prophylactic measure and the immunity is practically permanent.

PROTOZOA.

A protozoon can be seen only with the aid of the microscope. The animal micro-organisms or protozoa, of which there are many varieties, vary in size and shape much more than do the vegetable bacteria, while attached to many of the former are different shaped appendages which enable them to move about, or perforate animal tissues in their immediate neighbourhood.

Varieties of protozoa pathogenic to man :—

Flagellata, with whip-like appendages, trypanosomes, the cause of sleeping sickness, being an example.

Sarcodina, without any capsule, amœbæ, the cause of dysentery, being an example.

Sporozoa-sporulating forms, plasmodia, the cause of malaria, being an example.

Ciliata, with cilia attached, balantidium coli, the cause of diarrhœa, being an example.

Protozoa invade the body by inoculation or ingestion.

Inoculation—either through the intact skin by the bite of a mosquito or other blood-sucking protozoa as in malaria.

Ingestion—through liquid or solid food as in amœbic dysentery.

Action of Protozoa.—Those varieties of protozoa which are known to cause disease in man are few in number and are parasitic in nature, but there are a large number causing disease in animals and plants, the majority of which are saprophytic.

Intestinal Protozoa.—The example of this is the protozoon of dysentery. There are 2 stages in its life-history, an active and a cystic stage by which the amœba reproduces itself. Both stages are found in the large intestine. If the individual has sufficient resistance to the activities of the amœba, the latter forms a cyst which is evacuated with the fæces. In due course if such a cyst is swallowed it passes entire through the stomach and comes to rest in the large intestine, where it develops into four active amœbæ. These amœbæ erode the blood-vessels of the mucous membrane, and live on the red blood-corpuscles. They also form abscesses in the liver.

Blood Protozoa.—Examples of these are those causing sleeping sickness, malaria and kalar-azar, infantile spleno-megaly and tropical ulcer.

Distribution of Protozoa.—They are found in sea water, stagnant fresh water, and in moist soils, and the cysts of amœbæ can exist in a damp medium but perish quickly if dried. The infection is not carried by air.

Reproduction of Protozoa.—In some species the reproduction is as simple as that which obtains in bacteria, but in others it is very complicated. Thus a protozoon may be living in one animal, but in order to infect another animal the parasite has to be conveyed by the bite of an insect which has sucked up some of the blood of the first animal, together with some of the parasites. The exact method of reproduction is only known in the case of malaria.

ANAPHYLAXIS.

If a patient has been injected with a serum, for instance anti-diphtheritic, anti-streptococcic or anti-tetanic serum, and is given a second injection on another occasion with the same or some other serum, he or she may develop the condition known as anaphylaxis, which means " against immunity,"

a condition in which supersensitiveness is produced by the first injection, and this apparently lowers the immunity of that particular individual.

Anaphylaxis is a rare complication, and it is not known how long anyone who has had an injection of serum may be liable to it. The liability to its occurrence commences after an interval of 10 days from the last injection, there being no danger in repeating the injection if the interval is less than this. Rarely a person may suffer from anaphylaxis who has never had an injection of serum.

Symptoms and Signs.—The first indication is a swelling at the site of injection, and this œdema may spread over the whole body, though as a rule it affects only the face and eyelids. A rash may appear. Rarely acute and grave symptoms, such as a rigor, rapid pulse, urgent dyspnœa and collapse follow the injection, and death has been known to occur from syncope.

Treatment.—If it is desirable to give a patient another injection of serum 10 days or so after the former injection, the presence or absence of the anaphylactic state must be ascertained before injecting the full dose. The doctor will, therefore, inject very small doses, say $\frac{1}{2}$ to 1 c.c., at intervals of half an hour for 2 or 3 doses. If signs of anaphylaxis do not appear the remainder of the dose can be given with impunity. If signs and symptoms of anaphylaxis supervene, the patient will be given an injection of adrenalin 1 in 1000, and if necessary, artificial respiration will be carried out and oxygen administered.

Nursing.—When a nurse is informed that a patient is going to be given an injection of serum, she should ascertain from the relatives of the patient, or from the patient, whether she has had an injection before and for what purpose. The doctor, if he has not already ascertained this fact, can be told by the nurse.

APPENDIX II.

BLOOD TRANSFUSION. INTRAVENOUS INJECTION OF BANKED-BLOOD, PLASMA, SERUM, SALINE, SALINE-GLUCOSE.

BLOOD transfusion, or injection of banked blood, is the best treatment for hæmorrhage since the blood contains the red blood corpuscles in addition to the plasma. The transfusion of blood, however, has the disadvantage that the blood of the donor of the same group as that of the recipient may not be immediately available. Moreover, the Rhesus factor has to be taken into account. In midwifery practice the transfusion of blood is especially indicated when the condition of the patient is due to repeated hæmorrhages.

Blood Grouping.

When a blood transfusion has to be given to a patient (termed the recipient), it is essential to procure a donor whose red blood corpuscles are not clumped (agglutinated) when they are mixed with the recipient's blood. If the red blood corpuscles of the donor's blood do clump, the result is that innumerable microscopical emboli appearing in the blood of the patient will reach the kidneys, causing partial suppression of urine with hæmoglobinuria, or complete suppression, and even death. Other complications are rigors, collapse and dyspnœa, and jaundice due to hæmolysis of the clumped corpuscles.

The danger of the red blood corpuscles of the donor becoming clumped being obvious, a series of investigations were undertaken to ascertain in what circumstances such clumping would take place. This resulted in the division of the blood of persons (men, women and children) into four groups according to whether if the blood transfused would lead to clumping or otherwise.

In human red blood corpuscles there may be two agglutinogens termed A and B. According to whether a person's red blood-corpuscles contains one or other of these agglutinogens or neither or both of them, he or she is placed in one of the four blood groups. Besides considering, however, whether the red corpuscles of the blood to be transfused contained agglutinogens, the presence of agglutinins in the plasma of the recipient had to be considered, since the agglutinins are really antibodies (see p. 368), and their action on their corresponding agglutinogen would lead to clumping.

THE FOUR INTERNATIONAL GROUPS.

Group.	Presence of Agglutinogens.	Presence of Agglutins.
AB	A and B	None.
A	A	Anti-B.
B	B	Anti-A.
O	None	Anti-A and anti-B.

From the above table it is obvious—

1. That a group AB recipient could be transfused with a donor's blood of any group, since there are no agglutinins to cause clumping. Hence this group is termed the Universal Recipient. On the other hand, a donor's blood of group AB could not be given to a recipient of any other group, since if one introduces red blood corpuscles containing agglutinogens into the recipient clumping would result.

2. That a group A recipient could only be transfused with a donor's blood of group A, since if the donor's blood contained agglutinogen B the agglutinin B would cause clumping.

3. That a group B recipient could only be transfused with a donor's blood of group B, since if the donor's blood contained agglutinogen A the agglutinin A would cause clumping.

4. That O is a Universal Donor, since its red blood corpuscles do not contain any agglutinogens. On the other hand, the Universal Donor, group O, can only receive blood from a group O; blood from any other group supplying the agglutinogens and the anti-agglutinins in O would lead to clumping.

How to Ascertain to which Group a Patient Belongs.

This entails the provision of two test sera which must be prepared from specially selected blood of high reacting strength and stored frozen or dried, otherwise serious errors are likely to occur. A drop of test serum A and a drop of test serum B is spread each on a separate slide. With each test serum a drop from the blood of the patient is mixed with which it is wished to group. One of the following results will occur :

If the patient belongs to Group AB clumping will occur both in test serum A and test serum B.

If the patient belongs to Group A clumping will occur only in test serum B.

If the patient belongs to Group B clumping will occur only in test serum A.

If the patient belongs to Group O there will not be any clumping.

In certain cases, since the discovery of the Rhesus factor (Rh, see later), the latter has to be taken into account, because the point may arise whether the patient should be given blood which, in addition to the correct International group, it should also be Rh-negative. There is no need here to discuss the method of identification of these two groups which is an intricate business.

There are two methods of blood transfusion, one rapid and the other slow. In both citrated blood is used because if the blood is well mixed with the sodium citrate solution it will keep for weeks without clotting.

RAPID METHOD.

Apparatus, Instruments, and Solutions.

Two tables are required. On one to be assembled the apparatus, instruments, and solutions for collecting the blood from the donor (Fig. 67, A to H). On the other table, those for conveying the blood of the donor into that of the recipient (Fig. 67, 1 to 15).

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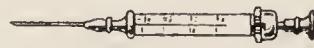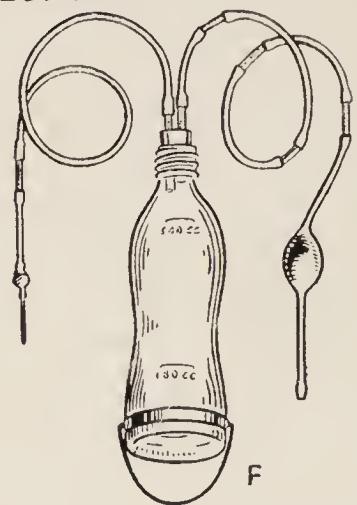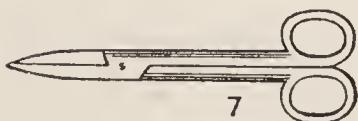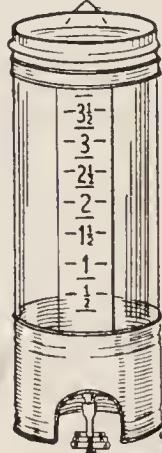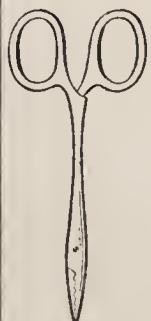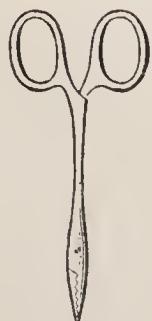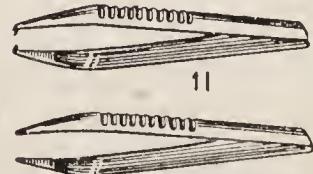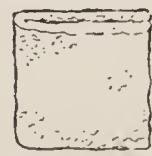
FIG. 67.

BLOOD TRANSFUSION. INJECTION OF BANKED-BLOOD, PLASMA
OR SERUM.

Taking Blood from the Donor.

A. Novocaine for injecting over the region of the vein of the donor.

B. Methylated spirit for sterilizing the skin over the vein of the donor.

C. Syringe for injection of novocaine.

D. Tourniquet.

E. Citrate solution for mixing with the blood.

F. Collecting flask into which the citrate solution has been previously poured or aspirated.

G. Keynes' needle.

H. Dressing.

Giving Blood to the Recipient.

1. Methylated spirit for sterilizing the skin over the vein of the recipient.

2. Novocaine for injecting over the region of the vein of the recipient.

3. Gloves.

4. Syringe for injection of novocaine.

5.
6.
7.
9.
10. }Instruments and ligatures and sutures if the vein of the
11.   recipient has to be opened.
12.
13.
14.

8. Flask for citrated blood, tubing, and number 1 or 3 serum needle with a short bevel—the "recipient's needle." If the vein is dissected out a cannula replaces the recipient's needle.

15. Dressings.

If banked-blood, plasma or serum is to be injected the instruments used are those depicted for giving blood to the recipient.

Method of Collecting the Blood from the Donor.

The donor should be lying with his, or her, arm resting on a macintosh sheet covered with a sterilized towel. A tourniquet is applied to the arm above the region of the flexure of the elbow, and this region is then sterilized with methylated spirit. The syringe, having been filled with novocaine by the nurse, its needle is inserted into the skin over the region of the vein selected, and the novocaine is injected, which raises a weal.

After a short time a Keynes' needle is thrust into the vein, and the blood collected in a flask into which the citrate solution has been previously poured, or aspirated, and the flask is gently shaken while the blood is running to ensure thorough mixing and to prevent clotting. When the required amount of blood has been collected the tourniquet is released, a swab is placed over the needle puncture, and the donor is told to well flex the forearm, which stops the bleeding. Finally, a dressing of gauze and a bandage is applied over the needle puncture.

Since the amount of blood withdrawn from the donor is on most occasions a pint, the amount of the citrate solution to be poured into the flask is in the proportion of 1 c.c. to 10 c.c. of blood. The vein of the donor is not usually dissected out, in fact the Red Cross Society does not allow this to be done to its donors.

Method of Conveying the Blood of the Donor to that of the Recipient.

A few c.c. of normal saline are poured into the flask, which is elevated to allow any air in the tubing and cannula to be expelled. The skin over the vein to be chosen is swabbed with methylated spirit. The recipient's needle is then inserted into the vein. The vein now generally chosen is a prominent one in the leg just above the ankle, or one in the forearm. As soon as the saline is entering the vein, the citrated blood from the donor is poured into the flask and then finds its way into the blood of the recipient. Lastly, the needle having been withdrawn, a gauze dressing and bandage is applied over the puncture.

The vein of the recipient is dissected out only if she is very fat or collapsed, when a cannula is fixed onto the end of the tube for insertion into the opened vein.

Precautions.

1. Distilled water should be used when preparing the solution of sodium citrate, since if tap water is used, 50 per cent. of the patients have rigors due to dead bacteria contained therein, whereas only 2 per cent. have rigors when distilled water is used.

2. Keynes' needle must be spotlessly clean, since the smallest particle of dirt, such as old blood clot, produces early clotting in the needle and interferes with the flow of blood through it.

3. Iodine or picric acid must not be used to swab the skin, as one or other may produce a rash.

The Rhesus Factor.

The above comparatively simple scheme for grouping, outlined above, has been slightly upset by recent discoveries. Landsteiner and Wiener, working in America, have found that 85 per cent. of persons, no matter what their blood grouping may be, have in their red blood-corpuscles an agglutinogen termed the Rhesus factor (Rh). The name Rhesus has been given because a similar agglutinogen is present in the red cells of rhesus monkeys, and it was in course of research work in which monkey's blood was being used for injection into other animals that the similarity with the human Rh agglutinogen was discovered.

Persons can, therefore, be divided into two new blood groups : those whose red corpuscles contain the Rh agglutinogen are termed Rh-positive, whereas those who have not the agglutinogen in their corpuscles are termed Rh-negative. There is one important difference between the International groups and the new Rh groups. In the former if a person has no agglutinogen in his corpuscles anti-agglutinins are always found in his serum. Since there are not normally any anti-Rh agglutinins in the serum there is, as a rule, no need to give Rh-negative blood to Rh-negative people, and it

is only necessary to select a donor of the correct International group in the usual way. If this were not so, many transfusions would have proved incompatible in the past when nothing was known about the Rh factor.

However, if several transfusions of Rh-positive blood are given to a Rh-negative person, anti-Rh agglutinins may develop in the recipient's plasma. Once the agglutinins have been formed any further transfusions of Rh-positive blood will be incompatible, since the donor's cells will be clumped by the recipient's plasma.

Reaction in Pregnancy.

A pregnant woman, if her fœtus is Rh-positive (the fœtus having inherited the Rh agglutinogen from its father), may develop anti-Rh agglutinins in her plasma in quite another way. This can be best understood by supposing that the mother receives repeated minute transfusions of Rh-positive blood from the fœtus. Such a woman, like the people mentioned above who have developed anti-Rh agglutinins in their plasma, must not be transfused with Rh-positive blood because the red corpuscles will be clumped by her plasma and a hæmolytic reaction will result.

When anti-Rh agglutinins are formed in the mother's plasma these agglutinins pass across the placenta into the circulation of the fœtus. Whereas the presence of anti-Rh agglutinins in the mother's plasma does her no harm, since the agglutinins will not clump her red cells (which are Rh-negative), when the anti-Rh agglutinins enter the circulation of the fœtus they set up a hæmolytic reaction because its red cells are Rh-positive. This destruction is now realized to be the cause of the group of diseases termed Erythroblastosis Fœtalis. In this disease the child may be born dead, though outwardly normal. It may be born with severe jaundice, or develop jaundice within a day or two of its birth, the condition being termed Icterus Gravis. In the mildest form of the disease the child is born alive, does not develop jaundice, but becomes very anæmic, termed Congenital Anæmia of the New Born.

The treatment for all these conditions when the child is born alive is the transfusion into one of its veins of Rh-negative blood, since it has been found that this blood is not quickly destroyed by the child as Rh-positive blood is. It will be understood that when the child is affected with one or other of the conditions mentioned, that it should always be suspected that the mother has anti-Rh agglutinins in her plasma, and should therefore only be transfused with Rh-negative blood of the correct International group.

Rh grouping of a person depends, as does the International grouping, on the group of the person's father and mother. The inheritance of the Rh agglutinogen can be most easily explained by stating that there are two kinds of Rh-positive persons, one who always hands on a Rh-positive " gene " (an hereditary germinal factor or unit in the chromosome, which carries hereditary transmissible characters) and one who hands it to only half his or her children, whereas there is only one kind of Rh-negative person who always hands on a Rh-negative gene.

If the child receives a Rh-positive gene from either or both of its parents, he or she will be Rh-positive, since the Rh-positive gene is a dominant. Only if both parents hand on a Rh-negative gene will the child be Rh-negative. When the fœtus is affected with erythroblastosis fœtalis it is usually found to be Rh-positive (as is its father), whereas its mother is found to be Rh-negative. From what has been stated it will be understood that the chances of future children being Rh-positive, and therefore also affected, depend upon whether the father is the type who hands on Rh-positive genes to every child or to only half the children. If he is the latter, some of the children will be Rh-negative and therefore will not be affected.

INJECTION OF BANKED-BLOOD, PLASMA, SERUM, SALINE AND SALINE-GLUCOSE IN CASES OF HÆMORRHAGE AND SHOCK.

It had been assumed that, in cases of hæmorrhage and shock, the fall in blood-pressure was due to the effect on the sympathetic nervous system causing stagnation of the blood in the abdominal blood-vessels. The modern theory is that

13

the effect of stimulation of the sympathetic nervous system, and so the collapse of the patient, is as follows :—

First, which often happens, the cutaneous and splanchnic blood-vessels are constricted, leading to chilliness, pallor and a primary rise of blood-pressure.

Second.—The capillaries of the skeletal muscles next become dilated, leading to a fall of blood-pressure, dilated pupils, cold sweat, and collapse.

Finally.—As a result, the walls of the dilated capillaries become abnormally permeable from want of oxygen, so that plasma passes out of the circulation into the tissues ; the red blood-corpuscles thus become concentrated and the volume of the blood diminished. The quantity of blood thus reaching the right side of the heart is seriously reduced, the red blood-corpuscles do not circulate properly, and the body-cells suffer from want of oxygen, the nerve cells in the vital centres of the brain being especially affected.

Although the number of red blood-corpuscles circulating in the plasma is obviously of great importance, nevertheless it has been found that after a single acute hæmorrhage there still remain 75 per cent. of these corpuscles, and that, with an increase in the quantity of fluid in the circulation, which enables these corpuscles to circulate properly, the patient nearly always recovers. If, however, the number of red blood-corpuscles falls below 75 per cent. the danger of a fatal termination is very real, and in cases of repeated hæmorrhage the percentage of these corpuscles may sink so low that blood transfusion is the only remedy which has a chance of saving the patient.

Fresh or banked-blood injection is employed when a patient has lost a large amount of blood during an operation, or preparatory to an operation, especially in anæmic patients, during which there may be considerable loss of blood ; or in cases of secondary hæmorrhage. Plasma or serum is generally reserved for cases of shock without serious loss of blood, but may also be used as a preliminary measure if blood cannot quickly be obtained.

Injection of Blood.—The blood-banks are not exclusively Group O. Although justifiable in cases of emergency, the use of 'universal blood' is not entirely without risk. Un-

explained calamities in the past are now being accounted for by the discovery of certain sub-groups of which the Rhesus factor is the most important to the obstetrician. The need for a direct test between the serum of the patient and red blood-corpuscles of the blood to be given should, therefore, be stressed. To overcome the difficulty of a suitable donor not being available, blood-banks have been formed at various Centres from which supplies can be obtained at short notice. The blood is then treated with sodium citrate to prevent clotting and stored in sterilized bottles, and either sealed with sterilized india-rubber bungs or metal caps, and then banked in a refrigerator at a temperature of 4° to 6° C. Consequently there have to be repeated renewals of the banked-blood to meet emergencies. Formerly the unused blood had to be poured down the drain, perhaps to the annoyance of those donors who became acquainted with this unavoidable waste, but now the plasma is recovered and this source of waste is prevented.

Injection of Plasma and Serum.—Plasma is the fluid portion of the blood devoid of its red and white corpuscles. Serum is the fluid portion of the blood after the latter has clotted. The proteins of plasma consist of albumin, fibrinogen, and globulin, those of serum of albumin and globulin, the fibrinogen in this case being used up by the clotting. Apart from their other uses, these proteins of plasma are of great importance when blood is transfused, since they prevent their escape from the capillaries into the adjacent tissues, within limits, and the same obtains when either banked-blood, plasma or serum is injected intravenously.

Realizing that the danger of hæmorrhage and shock was principally due to an insufficient quantity of fluid in the circulation (and in view of the contra-indications to the injection of saline and saline-glucose), injections of plasma and serum are now given with very satisfactory results. The plasma and serum obtained from a number of donors of different groups is pooled in order to neutralize the clumping effects on red corpuscles. Plasma and serum prepared in this way may, therefore, be injected into patients of any group with complete safety, and there is no need for a direct matching test. Plasma and serum can be dried, and in this form will keep for years

without deterioration, so that it may be sent to distant parts where facilities for giving transfusion would otherwise be lacking.

Injection of Saline and Saline-Glucose.—The injection of one or other of these solutions is of temporary benefit only, since these solutions not only reduce the protein level but also pass out of the capillaries more or less rapidly because they do not contain the proteins of plasma or serum. Moreover, owing to the contained salt, fluid is more easily drained from the circulation.

To sum up. When it is necessary to supply an oxygen-carrying fluid and a restoration of blood-volume, a blood transfusion or an injection of banked-blood is the best. If the purpose is to increase the blood-volume only, then the injection of plasma or serum will be all that is necessary, as in cases of shock without serious hæmorrhage. The advantage of plasma and serum is that since they can be kept for years a stock of these can be held by even small hospitals. Only in cases in which plasma has been lost from the circulation, e.g. burns, are plasma and serum therapeutically superior to whole blood. In cases of anæmia or in those of prolonged hæmorrhage, in which anæmia may be a major factor, plasma and serum are contra-indicated. In such cases it is preferable to inject concentrated red corpuscles rather than whole blood, since the object is to introduce the maximal number of red cells in the minimal volume. Concentrated red cell suspensions are prepared by drawing off the plasma from the blood after the cells have been allowed to settle at the bottom of the bottle. All the cells in a pint of blood can thus be obtained in a volume of less than half a pint.

The necessary apparatus and instruments for the injection of banked-blood, plasma or serum are the same as those depicted in Fig. 67.

SLOW METHOD.

This continuous drip method, which consists of a large transfusion or injection administered very slowly, was devised by H. L. Marriott and A. Kekwick of the Middlesex Hospital.

The object of a blood transfusion may be twofold ; either to restore the blood-volume in cases of hæmorrhage or shock or to supply red cells and restore the hæmoglobin percentage to normal in cases of anæmia. To the latter cases these workers found that the customary transfusion of 1 pint (568 c.cm.) of blood was quite inadequate in an adult, as such a quantity raises the hæmoglobin only 10 per cent. It was quite evident, therefore, that far larger quantities of blood should be given to patients in whom the hæmoglobin percentage was low. The rapid administration of large quantities of blood leads to dangerous overloading of the cardio-vascular system if given rapidly, and can only be safely given if transfusion is sufficiently slow. To effect such slow transfusion this apparatus (p. 390) was devised. In cases of hæmorrhage and shock to whom either blood, plasma or serum may be given to restore the blood-volume, rapid transfusion or injection is necessary. The apparatus can be used equally well for such cases owing to the complete control over the rate of transfusion or injection which it gives.

In 159 cases in which this method was used at the Middlesex Hospital, the average amount transfused was 5 pints (2·7 litres) and the average time taken was 29 hours. The largest single transfusion was 11 pints (6·3 litres) and the longest single transfusion was 62 hours.

Apparatus.—

1. To extract the blood from the donor.
2. To deliver the blood to the recipient.

For Extracting Blood from the Donor.—This can be done by the usual method, but Marriott and Kekwick maintain that a rapid removal is far preferable for two reasons. The one psychological, the donor not being so likely to be worried. The other because the common trouble of clotted blood blocking the needle is obviated, the blood not having time to clot.

1. An ordinary quart milk bottle, marked in c.c.
2. This bottle is connected on the one hand by pressure tubing to the Keynes' needle for insertion into the vein, and on the other to a reversed Higginson's syringe which is attached to a bottle and the donor holds it, which is strong enough to aspirate 500 to 600 c.c. of blood in 5 minutes.

3. 100 c.c. of a 3·0 per cent. sodium citrate solution is sucked up through the needle into the bottle.

4. Keynes' needle is inserted into the vein.

For Delivering the Blood to the Recipient.—

1. An oxygen cylinder, with pressure regulator and fine adjustment tap.
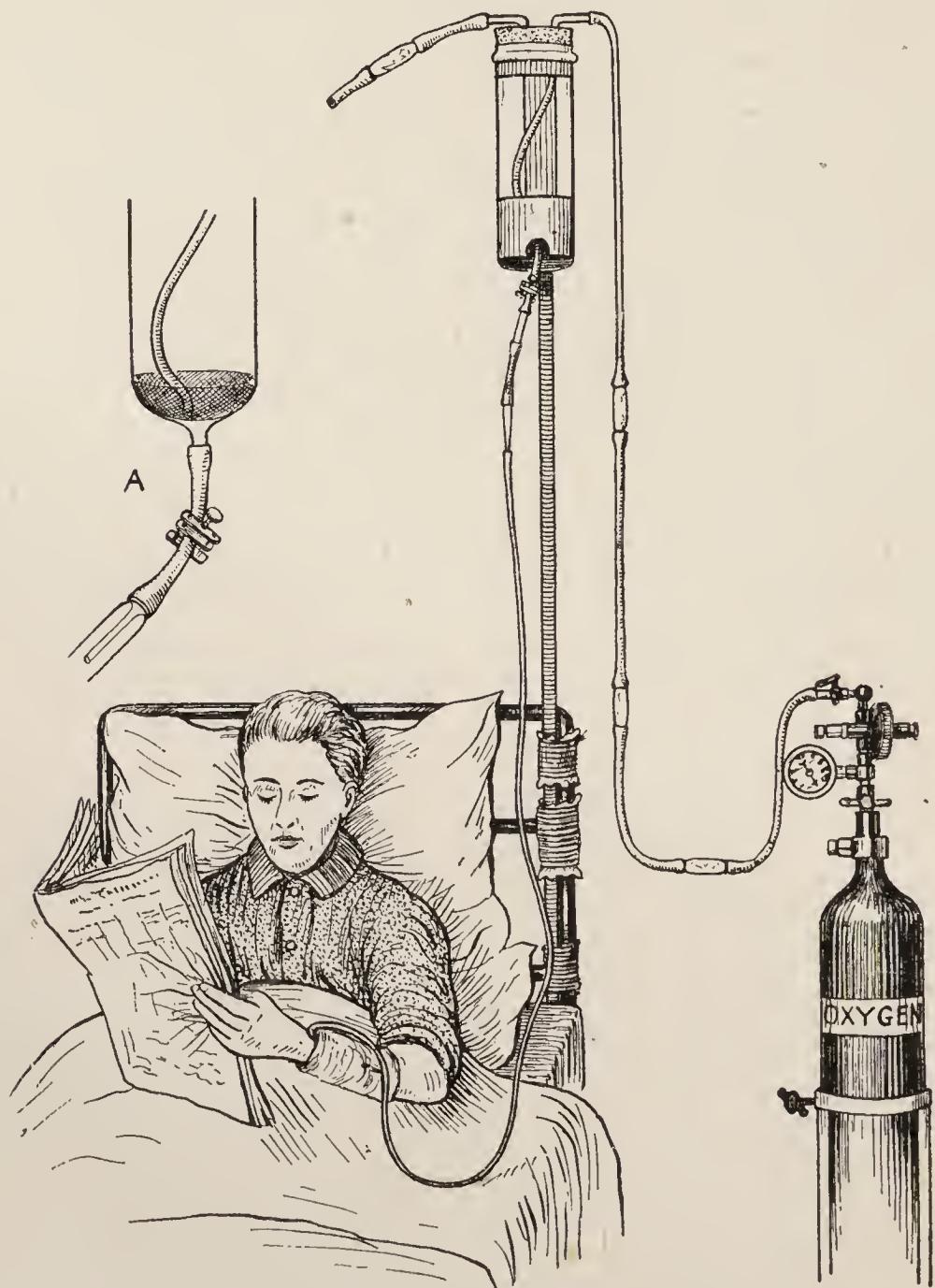
FIG. 68.—APPARATUS FOR DRIP TRANSFUSION.   See page 388.
A. Diagram of reservoir 3 showing gauze filter and Laurie drip bulb.
(*The Lancet.*)

2. Five feet of rubber tubing, interspersed with three filters, connecting the cylinder to

3. A glass reservoir, of 4 pint capacity, with a hole at the top closed by a rubber bung and a spout at the bottom to which the tube, conveying the blood from the reservoir, can be fixed.

4. Two glass tubes threaded through the bung so that their ends project outside and inside the reservoir. To the outside end of one of the tubes is attached the tube from the oxygen cylinder, and to its inside end a rubber tube reaching to the bottom of the reservoir. To the outside end of the other tube is attached a small piece of tubing which serves as an outlet for the oxygen.

5. To the bottom of the reservoir is fitted a pure nickel 28 gauge with 20 meshes to the inch wire-gauze filter to strain off clots.

6. Four inches of rubber tubing, with an adjustable screw clip connecting the reservoir to a

7. Laurie glass drip bulb, which is joined to

8. Seven feet of pressure tubing (external diameter, 5 mm.), which is attached to a

9. Glass cannula of special device which can be tied firmly into a vein.

Method of Delivering the Blood.—

1. Sterile normal saline is poured into the reservoir till the gauze filter is covered to about 100 c.c.

2. The oxygen is bubbled through the saline at the rate of 60 to 120 a minute.

3. The glass cannula is tied into the exposed vein.

4. The screw clip is adjusted to allow 40 drops per minute, or a pint in 4 hours, to be transfused.

5. The blood from the donors is poured into the reservoir.

Estimation of the Amount of Blood to be Transfused.—

1. The dose should be sufficient to restore the hæmoglobin percentage to approaching normal.

2. For a patient not bleeding, 40 drops a minute equals a rise of 10 per cent. hæmoglobin in 4 hours. For a patient bleeding a much faster rate may be necessary.

3. The dose is calculated by repeated estimation of the percentage of hæmoglobin in cases of anæmia and of the blood-pressure in cases of hæmorrhage and shock.

Caution concerning Donors.—

1. Several donors will be wanted. Their blood must be compatible with that of the recipient though not necessarily of the same group, but all the donors must belong to the same group as each other.
2. The amount of blood withdrawn from each donor must not exceed 50 c.c. per 14 pounds weight.
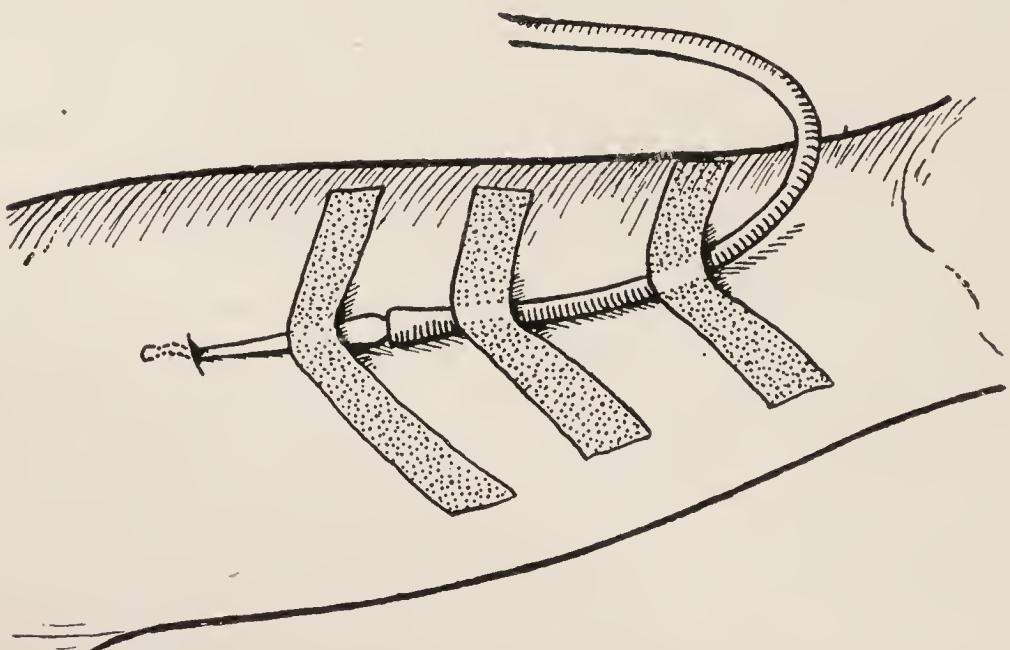
FIG. 69.—Showing the cannula and tubing fixed to the forearm by strips of strapping.—(*The Lancet.*)

3. A full contribution should be taken from each donor.
4. All the apparatus must be sterilized except the pump.
5. Distilled water must be used in preparing the sodium citrate solution.

Caution concerning Recipient.—

1. All the apparatus must be sterilized except the oxygen cylinder.
2. The froth on the blood, due to the oxygen bubbling through it, should be kept to a height of 2 to 3 inches which is an indication of 60 to 120 bubbles a minute.

The oxygen is to keep the blood aseptically stirred, because the corpuscles of citrated blood are apt to sediment in the reservoir and block the drip bulb. Air would serve the purpose equally well, but oxygen is readily available in hospitals.

3. The saline solution must be prepared with distilled water.

Indications in Gynæcological and Obstetrical Practice.—

Pre-Operative.—In anæmic women who have to be operated upon, or approaching delivery, and who cannot wait for restoration of a proper percentage of hæmoglobin by the administration of iron. In 24 hours a drip transfusion can raise the hæmoglobin from 20 to 80 per cent.

During Operation.—Useful because it is easy to control.

Post-Operative.—After severe loss of blood—post-partum hæmorrhage; extra-uterine gestation.

In puerperal and post-operative sepsis, accompanied by anæmia, such a transfusion breaks the vicious circle of anæmia and toxæmia.

Complications.

1. *Hæmaturia.*—This occurs when the blood of a donor belonging to a wrong group is conveyed to the recipient, also in cases of slight incompatibility. The doctor should be at once informed and the instruments prepared for intravenous injection of a 1 per cent. bicarbonate of soda solution.

2. *Rigors.*—Special treatment is not required.

3. *Collapse and Dyspnœa.*—A solution of adrenalin, 1 in 1000, should be available for subcutaneous injection, should the doctor so order.

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APPENDIX III.

X-RAYS, RADIUM AND RADON.

EVERY nurse during her training should have had some experience of the treatment by radium and X-rays. Moreover, a certain number of nurses, when they are qualified, elect to take up posts in the radium or X-ray departments. It is well, therefore, that a nurse should know something about radium and X-rays, other than the nursing duties associated with these methods of treatment. In the following pages an attempt has been made, by stripping the subject of most of its scientific terminology and assuming on the part of the reader only a very elementary knowledge of physics, to present the matter in the simplest terms. It is impossible to grasp the subject, however, even in its most elementary form, without some knowledge, be it ever so scanty, of the atom.

THE ATOM.

All solids, liquids and gases consist of elementary particles termed atoms. The simplest forms of matter, such as oxygen, nitrogen, copper, gold, and so on, are termed elements, and all the atoms of an element are identical. There are 92 principal elements. About 40 elements, including some of the 92, consist of naturally unstable atoms which continually break up, giving off radiations and particles ; these are said to be radioactive. In addition, a large number of artificially radioactive elements can be produced by bombarding stable atoms with sub-atomic particles. In compounds, two or more different atoms combine to form a molecule, a compound being made up of numbers of identical molecules.

The atom is composed of a nucleus around which circle particles of negative electricity called *electrons*. The nucleus consists of one or more *protons* and *neutrons*. The proton is charged with positive electricity, the neutron has no electric

charge, hence its name. The mass of the neutron is practically equal to that of a proton. Most of the mass of the atom is concentrated in what is called the nucleus. Exactly how the nucleus is made up cannot be said, but the protons and neutrons play the dominant part. The most simple atom is that of hydrogen, which is composed of a central nucleus (proton) circling round which is 1 electron.

Hydrogen is numbered 1 because it is the lightest atom, and, proceeding up the scale to the heaviest element uranium, numbered 92, the weight of the various atoms depends on the number of sub-elementary bodies of which they are composed. If these atoms have sufficient electrons, the latter are arranged in two or more rings round the nucleus. The inner ring of electrons is so firmly held by the proton, or protons, that they are difficult to detach. The outer ring, or rings, is more loosely held and so these electrons are more easily detached. The amount of positive electricity in the protons is equal to the combined amount of negative electricity in the electrons. Thus the power of attraction, or repulsion, of the component parts of an atom is neutralized, and the atoms keep their arrangement peculiar to those elements to which they belong. Thus an atom has been compared to the solar system, the nucleus taking the place of the sun and the electrons, circling around it, that of the planets in their orbit. In 1903 Rutherford and Soddy advanced the theory of atomic disintegration in order to explain the many discoveries which had been made about radium ; briefly this theory is that some varieties of atoms are not so stable as was thought and so are liable to disintegration.

X-RAYS.

When in 1895 Professor William Conrad Roentgen was engaged in his laboratory at Würtzburg in a research to discover whether there were any other rays, besides those already known, and was using a Crookes tube (described later) covered with black paper, he noticed that a barium plantino-cyanide screen, in another part of his laboratory, was shining. This illumination, or fluorescence, is caused by the change in certain crystals whereby the passage of X or radium rays

through the crystals is revealed by the production of visible light rays. Roentgen then realized that there were some kind of rays being discharged from the tube which were able to penetrate the black paper and make the screen fluoresce, and so, obviously, different from the rays of light. He further experimented and found that if he placed an opaque object between the tube and the screen, a shadow of the object was cast on the screen. By taking different objects and thus placing them it was found that the degree of transparency (penetration of the rays) varied with the different objects, and that an ordinary piece of sheet lead prevented any of the rays penetrating it. Lastly Roentgen found that photographic plates, wrapped in black paper and enclosed in aluminium boxes, were sensitive to these rays, which he called X-rays.

It was due to this discovery that radiographs are able to be taken, since by placing an object, which will allow some rays to penetrate, between a photographic plate and the tube, a shadow of the object is imprinted on the plate, or if a screen is used, on the screen. The details of the object depend upon the resistance to the penetration of the rays in its different parts. Thus if the object happens to be the hand, the bones stand out most clearly, the cartilage not at all, and the remaining tissues hardly at all, because they are so easily penetrated by the X-rays.

To understand the significance of this discovery and the properties of X-rays, the essentials of the Crookes tube must be described. The original Crookes tube consists of a long glass bulb from which most, but not quite all the air has been pumped. The air pressure may be in the region of one-millionth of an atmosphere. A metal plate is sealed into each end of this tube, and these plates are connected to the terminals of an electrical generator capable of producing currents at various high voltages from 1,000 to 200,000 volts. The plate connected to the negative terminal is known as the cathode, and the positive plate the anode. When the generator is switched on a small current is found to flow through the residual air in the tube. This is accompanied by a faint glow in the tube, which appears to flow from the cathode to the anode. A detailed investigation of this cathode stream shows

that it consists of minute negatively charged particles, much smaller than the atom. These are now known to be electrons, and are the fundamental particles of negative electricity. They are repelled by the negative cathode and attracted by the anode, and so cross the tube at considerable speed. This speed is determined by the voltage applied across the tube.

The supply of electrons is maintained by the breaking up of atoms in the tube. Electrons are detached and travel to the anode, while the broken atom, now having a residual charge and called a positive ion, moves to the cathode, detaching electrons from the other atoms on the way. In his original experiments Roentgen was able to show that when the cathode stream struck the walls of the tube X-rays were given off from the point of contact.

This arrangement does not form a very efficient source of X-rays and Jackson soon introduced considerable improvements. He used a curved plate for the cathode, thus focussing the electron stream, and at the point of focus inserted a platinum plate as a target. In other designs the platinum plate is replaced by tungsten. The electrons bombard a small area on this target and are suddenly arrested, their energy being converted into heat, a small proportion becoming X-rays. The source of X-rays is then a fairly sharply defined focal spot on the platinum target.

The gas tube, as it is called, has only a limited output of X-rays, and is subject to numerous troubles in working. To overcome these difficulties Coolidge devised a tube the working of which was independent of the presence of residual gas. The cathode plate is replaced by a closely wound tungsten wire spiral which is heated to incandescence as in an ordinary electric lamp. Such a heated filament forms a very effective source of electrons in large quantities. When the voltage is applied to the end of the tube these electrons are drawn off from the filament to the target to produce X-rays. The vacuum in a Coolidge tube is as complete as possible, and this results in working of great stability. Furthermore, the output of X-rays can now be controlled with great accuracy by controlling the filament temperature, and hence the number of electrons emitted.

A modern X-ray tube, therefore, consists of a very highly

evacuated gas envelope (a few recent models are made of steel and porcelain) into which are sealed a filament and a target or anode. The filament consists simply of a fine spiral of tungsten wire which is heated by independent electrical supply. The anode consists usually of a heavy copper tube into the end of which is sealed a block of tungsten to act as a target and a source of X-rays. Since a great deal of heat is generated at the target, some form of cooling is required. For small tubes radiation of heat from the anode is sufficient, but in the case of high-power tubes used for therapeutic purposes, recourse is made to water or oil cooling. The tube is excited by an electrical generator capable of supplying currents at voltages from 50,000 to 200,000 volts, and even up to 1,000,000 volts.

The intensity of quantity of X-rays produced depends on the number of electrons passing through the tube and on the voltage applied to the tube. The quality, or penetrating power, depends only on the voltage applied, increasing rapidly with an increase of voltage.

RADIO-ACTIVITY.

Professor Becquerel, knowing that X-rays affected a photographic plate, conceived the idea that fluorescent substances might do the same. Taking some uranium salts, which had been made to fluoresce, and exposing them to a photographic plate, he found that the plate became fogged, and at first attributed this fogging to the light given off by the fluorescence. Meanwhile he had put away in a dark cupboard some uranium salts and photographic plates and forgot all about them for a time. When eventually he developed the plates he found that they had been fogged just as they had been when exposed to the fluorescent uranium salts in the sunlight. It was thus obvious that neither light nor fluorescence had anything to do with the fogging which must have been produced by some radiation emitted by the uranium itself. Becquerel (1896) named this property of uranium *radio-activity*, and it was soon found that another element, thorium, possessed the same power.

RADIUM.

Professor and Madame Curie then undertook a research into the relative degrees of radio-activity in various samples of ore containing uranium, and found by their quantitative measurements that the degree of radio-activity depended upon whether the uranium was separated from the ore as pure uranium oxide, or whether the uranium was in its natural state. Thus the chemically pure salt was four times less radio-active than when the uranium was tested in its natural state, that is in an ore. It was thus apparent that the ores in which uranium is found must contain some substance, or substances, of far greater radio-activity than the uranium salt. The ore which gave the greatest amount of radio-activity was pitchblende. Now pitchblende contains aluminium, copper, iron, lead, and phosphoric acid, none of which are radio-active, and so, obviously, the radio-activity must be due to some substance in the residue after the former have been eliminated.

As the result of prolonged chemical research the Curies obtained from the residue the salts of two new substances which were the sources of the radio-activity. One of these elements was called *Polonium*, after the country in which Madame Curie was born, and the other *radium* (1898). Polonium is not used as a therapeutical agent because it is too short-lived, half its activity disappearing in 5 months.

By further chemical investigations Madame Curie was able to obtain radium in a pure state. It is a white metal, but so quickly does it change into radium hydroxide that but few people have ever seen it. It was also found that there is a constant ratio between the amount of uranium and radium in a given sample of ore containing uranium, from which it was gathered that uranium was the parent of radium. That is, by steps which need not detain us, uranium is gradually changed into radium. The quantity of radium in a sample of pitchblende is very minute; thus in one ton of ore there are only 200 milligrams or less of radium. It is because of the long and elaborate processes on such a large mass of ore to obtain such a small quantity of radium that this metal is so expensive.

The next problem to solve was, why is radium radio-active, in other words, what is the source of its radiations? By experiments which are very intricate and need not be described, it was found that these radiations were due to disturbances in the nuclei of atoms, with the result that the formation of the atoms was so altered that they gave off particles and radiations of energy. Just as the atoms in the components of a cartridge inserted in a gun can be so disturbed when the trigger is pulled and the cap is fired, that an enormous amount of energy is released, so it is with the atoms of radium, only in this case we do not know what, so to speak, fires the cap. Since this disturbance of the atoms is always taking place, it is said to be spontaneous, for want of a better reason.

All natural radio-active atoms give off one or more of these types of radiation known as alpha, beta and gamma rays. The alpha rays are nuclei of helium atoms, and soon annex a couple of electrons to form helium gas. The beta rays are simply high speed electrons identical, except for speed with the cathode stream in the X-ray tube. Gamma rays, which are true rays, are really X-rays, though most of them have much shorter wave-lengths and so greater penetrating power than the X-rays produced by ordinary apparatus. It is possible to generate, with a 1,000,000 volt apparatus, X-rays of similar penetrating power to the gamma rays of radium. The three types of radiation are easily distinguished by their very different penetrating powers. Alpha particles are arrested by a few centimetres of air or a piece of paper. Beta particles will not usually penetrate more than about a millimetre of lead or silver. Gamma rays are often easily measurable after passing through several inches of lead.

When alpha particles are given off, the radium atoms are converted into another element termed *radon*, which is a gas. Radon, in its turn, gives off another alpha particle, and is converted into another element, *radium A*. Similar processes through the series of elements radium B, C, D, E and F, radium F being finally converted into lead. Tubes used in radium therapy, and originally filled with radium and sealed, actually contain all these elements in a state of equilibrium, though the total activity falls very slowly, reaching half its original strength in 1690 years. The most important elements

in the series from the medical point of view are radium B and C, which emit gamma rays, those from radium C being very penetrating, and so therapeutically useful.

The first biological effect in the form of a cutaneous erythema to be observed from radium was the Becquerel burn on the abdomen from a plaque carried in Becquerel's waistcoat pocket in 1897. Such effects had been known to occur with X-rays, which had been used experimentally by medical men between 1896 and 1900. The biological effect of beta and gamma rays, as of X-rays, is essentially destructive to living cells. It was found, however, that immature and rapidly dividing cells were more easily destroyed than those of healthy tissues. This, in addition to their penetrating power, has led to the use of X-rays and gamma rays in the treatment of malignant growths. Beta rays, owing to their small penetrating power, have only limited therapeutic possibilities, but they are used with success in small doses for certain skin diseases.

For clinical purposes radium is sealed in small needles and tubes of platinum or gold. Needles are essentially designed for interstitional insertion, and both needles and tubes are used on moulds for external irradiation. The platinum, or gold, is usually from half to 1 millimetre thick, and serves to cut off all the alpha and beta rays, the gamma being easily transmitted. The action of the rays on the atoms in the tube walls gives rise to the emission of secondary beta and gamma rays, but these can usually be neglected.

It is interesting to note that in the radio-active elements there is the phenomenon of one element changing into another, a result inconceivable to science 50 years ago. Similar changes in ordinary elements, produced by bombardment with subatomic particles such as alpha particles and neutrons, are now commonplace, although the quantities evolved are minute. Thus the dream of the alchemists of old, who tried to change other metals into gold are, at least, partially realized. It is now even possible in this way, to make most elements temporarily radio-active, though so far the activity is slight and short lived. These facts do, however, open considerable possibilities in the future.

DIAGNOSIS BY X-RAYS.

X-rays are used to diagnose fractures, diseases of joints, heart, lungs, kidneys, and intestine by means of a barium meal, and with a view to determine whether the Fallopian tubes are permeable in cases of sterility. In the latter case lipiodol is injected into the uterus, and, finding its way into the Fallopian tubes, a radiogram is then taken. X-rays are also used in the form known as deep X-ray therapy for certain diseased conditions.

DEEP X-RAY THERAPY.

Deep X-ray therapy is employed by some gynæcologists for the treatment of serious hæmorrhage due to fibroid tumours of the uterus or to chronic metritis. X-rays are also at times employed in the case of a malignant ovarian tumour if an operation is contra-indicated. In the latter case the results, but only for a time, may be most striking, the tumour being reduced in size considerably and all demonstrable ascites disappearing. Good results have been obtained in leukoplakia and carcinoma of the vulva.

Deep X-rays are employed also, generally in association with, but at times without, radium, for cancer of the uterus; as a prophylaxis after the radical operation for cancer of the uterus, and after the removal of malignant ovarian tumours, with the purpose of destroying any cancer cells which may have escaped removal at the operation.

As regards cancer of the uterus, radium alone gives better results than X-rays alone, but the best results are to be obtained by a treatment combining the use of radium and of X-rays.

In the case of chronic metritis, and of some fibroid tumours of the uterus in women 38 years of age or over, medium voltage X-ray therapy will arrest the bleeding by causing atrophy of the ovaries and so inducing the menopause. As regards the treatment of fibroid tumours, the tumour must not present any symptoms or signs of degeneration, and must not be so large that its size is the reason why the patient has sought relief, since the shrinkage resulting will probably not be sufficient to relieve her to any extent.

RADIUM THERAPY.

Radium.—For clinical use, the chemical processes entailed in extracting radium are arrested at the stage when a salt of radium is obtained. This is necessary as pure radium metal is chemically unstable, and it rapidly forms radium hydroxide when in contact with air. Furthermore, the radiations emitted by radium atoms are quite independent of the state of chemical combination of the element. The sulphate is most commonly used. Since the quantities in general use are very small, the salt is usually mixed with aluminium oxide or some similar inert powder, in order that the containers shall be completely filled. This also results in a uniform distribution of the radium throughout the container, a matter of no little importance. The radium salt is filled into containers which differ according to the use to which they are going to be put. The radium content may vary from 1 to 50 milligrammes.

There are three main varieties :—

1. Needles with sharp points, used when it is necessary to insert the container into a growth.
2. Tubes with blunt ends, used largely in intra-cavity treatment.
3. Flat plaques or capsules, for the treatment of very superficial lesions.

Needles, tubes and plaques are usually made of gold or platinum, occasionally of silver. The heavier metals are chosen because they can be made much thinner and so take up less room, while at the same time providing adequate filtration. For many types of surface treatment needles and tubes are mounted on a mould of wax or similar plastic material up to 1 or 2 centimetres thick, and placed over the body at the desired site. When used for cancer of the cervix uteri and similar conditions, tubes are almost universally employed, since the method of inserting needles into the cervical growth is not nearly so efficacious. The tubes are usually housed in suitably shaped applicators of platinum or silver. In some types of treatment these applicators are in addition enclosed in containers of rubber or cork. The applicators serve the purpose of holding the radium from

immediate contact with the body surfaces, and thus ensure a better distribution of radiation through the tissues. They are inserted into some of the cavities of the body in such a way as to give an adequate dose of radiation throughout the volume of growth concerned.

Teleradium.—A bomb, or as the French and German radiologists term it, a cannon, is the concentration of a large quantity of radium in one applicator. This method of treatment is termed teleradium. The applicator consists of a large lead block with the radium tubes mounted at its centre. The radiations emerge from an aperture of 5 or 6 centimetres diameter, the radium-skin distance being 5 to 10 centimetres. The amount contained in bombs at present in use may be anything from 1 to 10 grammes.

The idea underlying the use of a bomb is to direct an intense beam of gamma rays through the superficial tissues at a deep-seated lesion. Multiple fields and crossfire result in a large dose on the lesion without severe injury to overlying tissues. The technique of application is very similar to that used in X-ray therapy, the gamma ray beam replacing the X-ray.

Radon.—It is pointed out (q.v.) that the first decay product of radium is radon, a gas. This gas continues to decay through the radium series, thus producing radium B and C, which are clinically useful products. For some purposes it is useful to separate the radon from its parent radium and to use it clinically. A solution of radium chloride in hydrochloric acid is sealed in a glass flask, and when sufficient radon has been evolved it is pumped off. The gas is then taken through an elaborate series of chemical purifications, and finally sealed into fine glass capillary tubes. Owing to its formation of radium B and C, it can then be used in very much the same way as radium. The radium in the glass flask will continue to produce more radon, and so almost an indefinite quantity is available.

Capillaries containing radon may be inserted into platinum or gold needles or tubes and used in a similar way for interstitial, intra-cavity or surface treatment. In some types of interstitial treatment it is not desirable to have to remove the radio-active sources, and so radon capillaries are placed in

small platinum or gold tubes, termed seeds, and these are left *in situ* in the tissues indefinitely when, after a few weeks, they are practically inactive.

The chief difference between radium and radon for treatment is in the period of decay. The activity of radium is practically constant, falling to half value only after 1690 years. Radon, on the other hand, decays to half its value in 3·85 days, and its activity is negligible after 4 weeks. Thus the calculation of the dose required in any particular case is more complicated when radon is used, although it can now be estimated without great difficulty. It is clear that if radon replaces radium in a treatment, it will be necessary to start with a stronger source of radon than would be used for radium, while at the end of the treatment the radon source will be weaker. It is necessary in making calculations of dose that the total dose of radiation in the two cases shall be the same. It is known, moreover, that the cells of the body react differently to different dose-rates. Thus in a long radon treatment the dose at the start will be very high, and at the end very low, while the radium dose is constant, though the total dose in the two cases may be the same. In many gynæcological treatments the period is only 24 hours, and this factor is then probably not important.

On the other hand, radon has some advantages over radium. Thus, the size of the container of contact can be chosen to fit exactly a particular case, whereas with radium the surgeon may be limited to the type of container available. The risk of loss is less as the value of radon soon declines, while that of radium, a very expensive material, lasts almost indefinitely. Because of its small intrinsic value, radon can be used for walking patients or experiments. When used interstitially, particularly in the tongue, tonsil or œsophagus, the breaking of the holding thread may result in the tube passing into the gastro-intestinal system. With radon the matter is not so serious, and very often the seed can be left to decay in activity *in situ*. With radium, however, immediate removal is necessary.

GLOSSARY

(NOTE.—In the derivations, the Greek words are given in English spelling. Vowels, " a," " e," " i," " o," have been marked with signs indicating short or long sounds, where this seemed necessary as a guide to pronunciation, e.g. in " ăcinus " the " a " is short as in " man," while in " cāro " it is long as in " name " : " ĕ " represents the sound of " e " in " set," " ē " the sound in " scene " : " i " as in " hit," " ī " as in " mind " : " ŏ " as in " lot," " ō " as in " tone.")

Acinus. (L. *ăcinus*, grape.) The smallest lobules of a compound gland, *e.g.* the breast ; also a dilatation forming the end of a small passage, *e.g.* air sacs of lungs.

Adenomyoma or **Endometrioma.** (G. *adēn*, gland ; *mus*, muscle ; *-ōma*, tumour.) A tumour composed of glandular and muscular tissue.

Adhesion. (L. *adhærēre*, to stick to.) The joining together of parts which normally should not be joined.

Alchemist. (Of doubtful derivation.) One who practised alchemy, supposed art of transmuting metal into gold and of finding a remedy for all diseases.

Amenorrhœa. (G. *a*, no ; *mēn*, month ; *rhoia*, flow.) Absence or abnormal cessation of the periods.

Amnion. (G. *amnion*, lamb.) The inner of the two fœtal membranes.

Amœba. (*amoibē*, change.) A protozoon.

Ampullary. (L. *ampulla*, a jug.) A dilatation like a flask. Ampullary layer, the dilated glands forming part of the decidua.

Anæmia. (G. *an*, no ; *haima*, blood.) A condition in which the blood is deficient in hæmoglobin or in the number of red blood corpuscles.

Anaphylaxis. (G. *ana*, against ; *phulaxis*, protection.) A condition of super-sensitiveness produced by a first injection of serum which lowers the immunity of the person injected.

Antibodies. Substances secreted by the cells of the body to protect itself against the results of bacterial infection.

Ascites. (G. *askos*, bag.) A collection of serous fluid in the peritoneal cavity.

Atresia. (G. *a*, no ; *trēsis*, boring.) Absence or closure of a normal opening, *e.g.* of the cervical canal.

Atrophy. (G. *a*, no ; *trŏphē*, nourishment.) A wasting or diminu tion in the size of a part, defect or failure of nutrition.

Bacteriolysin. (*bacteria* : G. *lusis*, dissolution.) An antibody which shrinks, or breaks up, bacteria.

Bacterium. (G. *bacterion*, a little rod.) A single vegetable cell belonging to the lowest form of life.

Blastocyst. (G. *blăstos*, germ ; *kustis*, cyst.) The developing zygote.

Cachexia. (G. *kăkos*, ill ; *hexis*, habit.) State of marked ill-health or malnutrition.

Capsule. (L. *capsula*, little box.) Supra-renal capsule, a small organ on anterior upper surface of kidney.

Carious. (L. *cariŏsus*, rotten.) Dental caries, damage to enamel and dentine of teeth by acid-producing bacteria.

Caruncle. (L. *caruncula*, diminutive from *căro*, flesh.) A small fleshy eminence, *e.g.* urethral caruncle.

Chlorosis. (G. *chlŏros*, green.) A form of anæmia affecting girls at puberty, characterized by its greenish colour. Now rare.

Chorion. (G. *choreon*, skin.) The outer of the two fœtal membranes.

Coccygodynia. (G. *kokkux*, coccyx ; *odunē*, pain.) Pain in region of coccyx due to neuralgia or injury.

Colpo-perineorrhaphy. (G. *kolpos*, vagina ; *perinaion*, perineum ; *raphē*, suture.) Removing a piece of the posterior vaginal wall, suturing the edges, and repairing the damaged perineal body.

Colporrhaphy. (G. *kolpos*, vagina ; *raphē*, suture.) The operation of narrowing the vagina by removing a piece of its wall and suturing the cut edges.

Colpotomy. (G. *kolpos*, vagina ; *temnein*, to cut.) Cutting through the vagina into the pouch of Douglas.

Coma. (G. *kōma*, stupor.) Unconsciousness occurring in the course of disease or following severe injury.

Condylomata. (G. *konduloma*, wart.) A wart-like excrescence near the anus or vulva, seen in cases of syphilis.

Convulsions. (L. *convellere*, to pull together.) Violent involuntary contractions of the voluntary muscles.

Corpuscle. (L. *corpusculum*, little body.) Usually refers to cells of the blood.

Cystic. (G. *kustis*, bladder.) A sac normal or otherwise, especially one containing a liquid or semi-solid.

Cystocele. (G. *kustis*, bladder ; *kēlē*, hernia.) Bulging of the bladder with the anterior vaginal wall.

Decidua. (L. *dēciduus*, falling off.) Lining of pregnant uterus, most of which is cast off after labour.

De-hydrate. (L. *dē*, away ; G. *hūdōr*, water.) Removal of water from a substance.

Diathermy. (G. *dia*, through ; *thermainein*, to warm.) A form of electrical cautery in which the current enters by a large pad on the back and leaves at the point of the particular instrument being used. Also used for warming up local parts of the body.

Dysmenorrhœa. (G. *dus*, difficult ; *mēn*, month ; *rhoia*, flow.) Painful menstruation.

Dyspnœa. (G. *dus*, difficult ; *pnoē*, breathing.) Difficult or laboured breathing.

Eclampsia. (G. *ek*, out ; *lampein* to flash.) An attack of convulsions.

Ectopic. (G. *ektopos*, displaced.) Out of normal place : ectopic gestation, a fertilized ovum developing outside the uterus.

Embolism. (G. *en*, in ; *ballein*, to throw.) Blocking of an artery or vein, by a clot carried in the blood-stream. If pulmonary artery is blocked death from suffocation may occur.

Embryo. (G. *endon*, within ; *bruein*, to grow.) The fœtus during its development.

Empirical. (G. *empirikos*, experimental.) Based on experience.

Endo-cervicitis. (G. *endon*, within; *cervix*, neck; *ītis*, inflammation.) Inflammation of lining of neck of uterus.

Endocrine. (G. *endon*, within ; *krīnein*, to separate.) Endocrine glands, ductless glands with an internal secretion, *e.g.* the ovaries, adrenals, thyroid, pituitary.

Endometrium. (G. *endon*, within ; *mētra*, uterus.) Mucous membrane lining the uterus.

Epithelioma. (G. *epi*, on ; *thēlē*, nipple ; *ōma*, tumour.) A cancer consisting of epithelial cells.

Erosion. (L. *ērōdĕre*, to eat out.) The eating away of a part.

Exsanguinated. (L. *ex*, out ; *sanguinis*, blood.) Deprived of blood.

Extravasation. (L. *extrā*, beyond ; *vas*, vessel.) Escape of blood from a vessel into the tissues.

Fascia. (L. *fascia*, band.) A sheet of tissue which invests the muscles.

Fistula. (L. *fistula*, pipe.) An opening into a hollow internal organ, *e.g.* vesico-vaginal fistula, an opening between bladder and vagina.

Follicle. (L. *folliculus*, a little bag.) A small excreting or secreting sac or gland.

Fornix. (L. *fornix*, arch.) That portion of the vagina above the level of the external os, thus anterior, posterior and lateral according to the position.

Gamete. (G. *gametēs*, spouse.) Sexual cells, male and female, which unite with each other to form the zygote.

Hæmatoma. (G. *haima*, blood ; *ōma*, tumour.) A swelling due to effused blood.

Hæmato-salpinx. (G. *haima*, blood ; *ōma*, tumour ; *salpinx*, trumpet.) Collection of blood in the Fallopian tube.

Hæmophilia. (G. *haima*, blood ; *philein*, to love.) An abnormal tendency to bleed, usually hereditary.

Hermaphrodism. (G. *hermēs*, Mercury ; *aphrodītē*, Venus.) Hermaphrodite, an animal which has both male and female sexual organs. There is no reported case in the literature of a human person having both ovaries and testes ; all supposed cases are really pseudo-hermaphrodites.

Hormone. (G. *hormao*.) A secretion of an endocrinal gland. The word means I call or arouse or a messenger.

Hydro-salpinx. (G. *hydrō*, water ; *salpinx*, trumpet.) Collection of watery fluid in a Fallopian tube.

Hyperæmia. (G. *huper*, over ; *haima*, blood.) Excess of blood in any part of the body.

Hyperemesis. (G. *huper*, over ; *emēsis*, vomiting.) Hyperemesis gravidarum, the excessive vomiting of pregnancy.

Hypertropic. (G. *huper*, over ; *trophē*, nutrition.) Excessive enlargement of a part.

Hypospadias. (G. *hupo*, under ; *spān*, to draw.) Congenital opening of urethra on the underside of penis, or an opening of the urethra into the vagina.

Hysterectomy. (G. *hutera*, uterus ; *ectomē*, excision.) Removal of the uterus either by abdominal route or through the vagina.

Inflammation. (L. *inflammātus*, set on fire.) Condition of the tissues as a result of irritation.

Leucorrhœa. (G. *leukos*, white ; *rhoia*, flow.) Any discharge from the genital canal not consisting of blood, pus, water, or fæces ; used for excessive secretion of the mucous membrane of the uterus.

Leukoplakia. (G. *leukos*, white ; *plex*, plate.) A disease characterized by the formation of white patches on the tongue or on the inner surface of the vulva.

Levator Ani. (L. *levātor*, lifter.) The muscle that supports and lifts the rectum and vagina, aids defæcation.

Lipiodol. A compound of iodine in poppy-seed oil : it contains 40 per cent. of iodine, but is non-toxic.

Lithopædion. (G. *lithos*, stone ; *paidion*, child.) A dead fœtus which has become calcified.

Lumen. (L. *lumēn*, light.) The clear space inside a tube.

Malignant. (L. *malignans*, acting maliciously.) A condition leading to death.

Meatus. (L. *meātus*, passage.) Meatus urinarius, the orifice of the urethra.

Menopause. (G. *mēn*, month ; *pausis*, cessation.) The age when menstruation normally ceases.

Menorrhagia. (G. *mēn*, month ; *rhēgnunai*, to burst forth.) Profuse menstruation.

Menses. (L. *mensis*, month.) The monthly flow of blood, mucus, and shreds of endometrium from the uterus of woman.

Menstruation. (L. *menstruāre*, menstruate.) A physiological function associated with the discharge of the menses.

Metrorrhagia. (G. *mētra*, uterus ; *rhēgnunai*, to burst forth.) An abnormal uterine hæmorrhage.

Multicellular. (L. *multus*, many ; *cellulă*, cell.) Composed of many cells.

Myomectomy. (G. *mus*, muscle ; *ōma*, tumour ; *ektomē*, excision.) Enucleation of a fibroid tumour from the uterus.

Myxœdema. (G. *muxa*, mucus ; *oidēma*, swelling.) A disease characterized by dropsy of the face and hands, due to atrophy of the thyroid gland.

Nodule. (L. *nōdulus*, little knot.) A small swelling.

Œdema. (G. *œdēma*, swelling.) Swelling due to effusion of watery fluid into the connective tissue.

Oöcyte. (G. *ōon*, egg ; *kutos*, cell.) The unfertilized cell which escaped from a *Graafian* follicle in the ovary when it ruptured. Otherwise called the ovum, egg, or female gamete.

Oophorectomy. (G. *ōon*, egg ; *pherein*, to bear ; *ektomē*, excision.) Excision of an ovary.

Opsonin. (G. *opsōnein*, to prepare food for.) An antibody which makes the bacteria palatable to the phagocyte.

Oxidize. To combine or to cause to combine with oxygen.

Paretic. (G. *paresis*, relaxation.) Affected with paresis, paralysis.

Pedunculated. (L. *pedunculus*, a stem.) Having a stem.

Perineorrhaphy. (G. *perinaion*, perineum ; *raphē*, suture.) The operation of making a new perineum.

Phagocytes. (G. *phagein*, to eat ; *kutos*, cell.) Cells which destroy bacteria by enveloping and absorbing them.

Placenta. (L. *placenta*, a flat cake.) The organ, partly maternal and partly fœtal, situated in the pregnant uterus which is the means of conveying nourishment to, and waste products from, the fœtus.

Plastic. (G. *plasticos*, to build up.) Tending to build up tissue or restore a lost part.

Polypus. (G. *polus*, many ; *pous*, feet.) A pedunculated growth from a mucous surface.

Prophylactic. (G. *pro*, before ; *phulasso*, to guard.) Tending to prevent a disease.

Protozoon. (G. *prōtos*, first ; *zōon*, animal.) A single animal cell belonging to the next lowest form of life to a bacterium.

Pruritus. (L. *prurīre*, to itch.) Pruritus vulvæ, itching of external genital organs of the female.

Pseudocyesis. (G. *pseudēs*, false ; *kukēsis*, pregnancy.) A condition in which a woman thinks she is pregnant when she is not.

Purulent. (L. *purulentus*, containing pus.) Consisting of pus.

Pus. (L. *pus*.) The result of inflammation, a secretion consisting of dead cells and a thin fluid.

Pyæmia. (G. *puon*, pus ; *haima*, blood.) Septicæmia characterized by the formation of local abscesses.

Pyo-salpinx. (G. *puon*, pus ; *salpinx*, trumpet.) Collection of pus in Fallopian tube.

Salpingectomy. (G. *salpinx*, trumpet ; *ektomē*, excision.) Removal of a Fallopian tube.

Salpingostomy. (G. *salpinx*, trumpet ; *stŏma*, mouth.) The formation of a new opening into a Fallopian tube, the lumen of which has closed, in an attempt to cure one form of sterility.

Saprophytes. (G. *saphros*, putrid ; *phuton*, plant.) Bacteria living on dead or decaying organic matter.

Sarcoma. (G. *sarx*, flesh ; *ōma*, tumour.) A malignant fleshy tumour.

Sclerosis. (G. *sklērōsis*, hardness.) An induration or hardening.

Sebaceous. (L. *sebāceus*, pertaining to sebum or suet.) Sebaceous gland, one secreting an oily substance.

Sordes. (L. *sordēs*, filth.) The mixture of epithelial débris and bacteria which collect on teeth and lips in low fevers.

Spermatozoon. (G. *sperma*, seed ; *zōon*, animal.) The male gamete or sexual cell.

Spore. (G. *spŏră*, seed.) The resting stage of a bacillus when its environment is not conducive to its reproduction, to be transformed into a bacillus when the surroundings are again favourable.

Squamous. (L. *squāmōsus*, scaly.) Plate-like.

Suppuration. (L. *sub*, under ; *puon*, pus.) The formation of pus.

Tertiary. (L. *tertiārius*, third in order.) Tertiary syphilis, or its third stage.

Therapy. (G. *therapeuein*, to wait on, cure.) Treatment of disease.

Thrombus. (G. *thrombos*, clot.) Clot in a blood-vessel remaining at the point of its formation.

Toxæmia. (G. *toxikon*, poison ; *haima*, blood.) Poisons produced by the body cells or by bacteria.

Trachelorrhaphy. (G. *trachēlos*, neck ; *rhaphē*, suture.) The repair of a lacerated cervix uteri.

Tungsten. A metallic element.

Unilateral. (L. *ūnus*, one ; *latus*, side.) Affecting one side only.

Uræmia. (G. *ouron*, urine ; *haima*, blood.) The presence of urinary constituents in the blood.

Ventral Fixation. (L. *venter*, belly ; *fixus*, fixed.) The cure of uterine retroposition by fixing the uterus to the abdominal wall.

Vesicular. (L. *vesicula*, a little bladder.) Composed of small sac-like bodies.

Voltage. Electromotive strength measured in volts.

Vulvitis. (L. *vulva* ; G. *itis*, inflammation.) Inflammation of the vulva.

Zygote. The fertilized cell resulting from fusion of the oöcyte and spermatozoon. (*See* Gametes.)

Zymosis. (G. *zumoein*, to ferment.)

Zymotic. An infectious or contagious disease.

A Selection of Questions on Gynæcology and Gynæcological Nursing set by the General Nursing Council for its Final Examination since the latter was instituted. In some examples two questions have been combined. The remaining questions set dealt with the same subjects but in different wording.

ANATOMY.

1. Describe the anatomy of the bones of the pelvis and give the differential characteristics between the male and female. (*See page* 1.)
2. Describe the position of the uterus, bladder and rectum in the pelvis. What changes are caused by an over-distended bladder? (*See pages* 12, 18, 19.)

COMPLICATIONS, POST-OPERATIVE.

3. What may a nurse do for her patient to relieve post-anæsthetic vomiting? (*See page* 341.)
4. What complications may occur after abdominal hysterectomy? Describe concisely how each may be recognized. (*See pages* 334–360.)
5. What would make you suspect that a recent abdominal wound has given way? What would you do when you discovered that it had done so? (*See page* 349.)
6. How would you distinguish between internal hæmorrhage and shock in a patient who has had a severe surgical operation? What treatment should be adopted in each case? (*See page* 336.)

INFECTIONS.

7. What is meant by cystitis? Give some of its causes and treatment of any one. (*See page* 153.)
8. What is a pyosalpinx? To what micro-organisms is the condition commonly due? (*See page* 138.)

9. To what is infection of the wound after abdominal section due ? How long after is this complication likely to manifest itself, and what signs would lead you to suspect that it was taking place ? (*See page* 347.)

10. What is meant by salpingitis ? Describe the nursing of a patient who has acute salpingitis. (*See page* 137.)

11. Enumerate the points of distinction between gonorrhœa and syphilis as seen in the female. (*See pages* 143–147.)

12. In what ways can syphilis injure the health of a patient ? (*See page* 145.)

MENSTRUATION.

13. What is amenorrhœa ? Discuss its usual causes. (*See page* 66.)

14. A woman has severe pain at her menstrual periods. What is this called, and to what causes may it be due ? (*See page* 78.)

MICTURITION.

15. What is meant by retention of urine ? Discuss some of the causes and briefly indicate their respective treatment. (*See page* 104.)

16. Differentiate between retention and suppression of urine. Mention briefly the nursing measures which may be adopted in each case. (*See pages* 104–112.)

17. What are the complications of urethral catheterization ? Describe in detail how you would pass a catheter. (*See pages* 217–220.)

MISPLACEMENTS OF THE UTERUS.

18. Of what symptoms may a patient with uterine prolapse complain ? Discuss what forms of treatment might be adopted. (*See page* 121.)

19. What is meant by retroversion ? What symptoms does this condition cause, and how is it treated ? (*See pages* 114–120.)

NURSING.

20. Under what conditions are bed-sores liable to form ? Explain in detail the means you would adopt to prevent their formation. In the event of a bed-sore forming, what treatment would be carried out ? (*See page* 350.)

21. In the absence of normal sterilizing equipment, how could the following be made ready for surgical use (i.e. as sterile as possible)? Instruments, dressings, bowls, and trays. (*See page* 302.)

22. Give in detail the feeding and nursing of a patient during the first 5 days after a hysterectomy. Why, in your opinion, was the dietary carried out? (*See page* 325.)

23. Describe some of the common discomforts after abdominal section. How would you relieve them? (*See page* 334.)

24. For what reasons would you send for a doctor in the first 12 hours after an operation in the case of an abdominal hysterectomy? (*See pages* 334–360.)

25. Describe the post-operative nursing (local condition only) of a case of perineorrhaphy. (*See page* 320.)

26. Describe the after-treatment from a nursing point of view of a patient upon whom a Wertheim's operation has been performed. (*See page* 352.)

27. Describe how you would prepare a room in a private house for an operation on the uterus. (*See page* 298.)

28. What steps would you take in an emergency to check bleeding along a drainage tube opening into the abdomen? (*See page* 322.)

29. Pending the arrival of a doctor, what would you do in a case of severe uterine hæmorrhage? To what may it be due? (*See page* 49.)

30. You are nursing a case after abdominal section. What signs would lead you to think that the patient was bleeding internally? What would you do? (*See page* 336.)

31. What can be done from a nursing point of view to alleviate the sufferings of a woman who has an inoperable growth of the uterus? What are the usual causes of death in this condition? (*See pages* 177–179.)

32. In what conditions is a bladder wash-out prescribed? Describe in detail the procedure you would follow in giving one. (*See page* 220.)

33. What advice would you give to a woman of 45 years of age who complains of a persistent blood-stained discharge? To what conditions may the discharge be due? (*See page* 76.)

34. State what you know of the causes of vomiting. How would you nurse and feed a patient in whom vomiting was a prominent symptom ? (*See page* 341.)

35. What precautions would you take when nursing a case of venereal disease (*a*) to safeguard others, (*b*) to safeguard yourself ? (*See pages* 146, 150, 151.)

OPERATIONS.

36. Give a description of the following positions used in gynæcological practice: dorsal, genu-pectoral, left lateral, semi-prone. (*See pages* 201–206.)

37. What symptoms may you expect in a case of pulmonary embolism ? Describe the patient's general condition and appearance, and give a detailed account of the nursing of such a case. (*See page* 345.)

38. What is meant by thrombosis ? Give examples., What are the important points in treatment ? (*See page* 344.)

39. For what reason may dilatation and curettage of the uterus be performed ? Indicate any dangers which may occur. (*See pages* 77, 93, 272.)

40. For what conditions may abdominal hysterectomy be performed ? Discuss how you would prepare a patient for this operation. (*See pages* 137, 170, 172, 177, 232.)

TUMOURS.

41. What symptoms would lead you to expect that a woman was suffering from cancer of the cervix uteri ? (*See page* 176.)

42. What is an ovarian cyst ? State reasons why an ovarian cyst may require operation. (*See pages* 181–184.)

43. What is a uterine fibroid ? What symptoms may it cause ? At what period of life do they commonly occur, and what advice would you give ? (*See pages* 162, 163, 170.)

44. Define and discuss urethral caruncle. (*See page* 157.)

VACCINES, SERUM.

45. What is the difference between a serum and a vaccine ? Give illustrations of each, and state what complications might arise as the result of an injection of serum. (*See pages* 373–375.)

Vaginal Discharge.

46. What is the significance of a vaginal discharge ? Give some of the more common causes at different ages. Enumerate four conditions in which vaginal douching is beneficial. How would you administer such a douche ? (*See pages* 96–101.)

47. You are told that a child of 7 years of age has a purulent vaginal discharge. To what may this be due, and what advice would you give the mother ? (*See page* 99.)

Various.

48. State briefly what you know of extra-uterine gestation. (*See page* 62.)

49. State what you know of pruritus vulvæ. (*See page* 102.)

50. Discuss briefly the methods by which bleeding can be arrested and give examples. (*See page* 49.)

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